SAPIENZA UNIVERSITÀ DI ROMA

FACOLTÀ DI SCIENZE MATEMATICHE, FISICHE E NATURALI

CORSO DI LAUREA IN SCIENZE E TECHNOLOGIE PER LA CONSERVAZIONE DEI BENI CULTURALE

ARCHMAT

(ERASMUS MUNDUS MASTER IN ARCHaeological MATerials Science)

PASTE CHARATERIZATION OF 3RD and 4TH MILLENNIUM BCE CERAMICS FROM ARSLANTEPE, TURKEY (3350-2800 BCE).

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ROME-ITALY

SEPTEMBER, 2016

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A THESIS SUBMITTED TO THE FACOLTÀ DI SCIENZE MATEMATICHE, FISICHE E NATURALI OF SAPIENZA UNIVERSITÀ DI ROMA IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE

2016

DECLARATION

I hereby declare that this thesis and abstract is my original work and that to the best of my knowledge, it neither contains any material previously published by another person, nor material that has been accepted for the award of a degree or any other qualification at this University or elsewhere, except where due acknowledgement has been made in the text. Where I have consulted the published or unpublished works of others, I have stated explicitly both in the text and bibliography.

This research was done under the supervision and guidance of Professoressa Marcella Frangipane of the Dipartimento di Scienze dell' Antichita at Sapienza Universitá di Roma, Italy.

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ACKNOWLEDGEMENTS

Firstly, I would like to express my sincere gratitude to my thesis advisor, Professoressa Marcella Frangipane of the Dipartimento di Scienze dell' Antichita at Sapienza Universitá di Roma for giving me the enormous opportunity to work on ceramic samples from Arslantepe and her continuous support of my thesis. Her patience, motivation, immense knowledge, and guidance helped me throughout the time of the research and writing of this thesis, and for this, I am most grateful.

My sincere thanks also go to Dr. Pamela Fragnoli of Freie Universität, Berlin, who was very instrumental and acted as a second advisor of this thesis. I am forever indebted to her for her valuable comments and suggestions which helped steer this thesis to an expected end. I am also grateful to Dr. Cristina Lemorini, Professoressa Cecilia Conati Barbaro, and Professor Giovanni Carboni, who gave me unlimited access to *Laboratorio del Museo delle Origini* and other research facilities. Without their support and advises, it would not have been possible to conduct this thesis. I am grateful to Dr. Vanessa Forte for her recommendations during my laboratory analysis, and to Dr. Francesca Balossi, for being available whenever I needed ceramic samples for analysis.

I acknowledge the funding received towards my Erasmus Mundus Master degree from the EACEA Commission of the European Union; the official funding body of the 2014-2016 Erasmus Mundus Archaeological Materials Science program.

Last but not least, I thank my fellow ARCHMAT colleagues for the academically challenging and exciting, as well as culturally divergent environment, and not forgetting all the moments we had in the last two years which positively impacted my studies.

I finally wish to express my profound gratitude to my family; my father and siblings and also to Professor Kodzo Gavua, for providing me with the continual support and encouragement throughout my years of study and during the process of research and writing this thesis, I will be forever grateful to them.

ABSTRACT

This research aims at defining the main characteristics of technological and compositional variability of ceramic production at Arslantepe during Periods VIA, VIB1 and VIB2 (3400-2800BC) in a framework of socioeconomic and political development. The stereomicroscope in a reflectance mode at a magnification of 1–6.3x was used to analyze a total number of 158 ceramic samples to identify and characterize the principal inclusions in the ceramic pastes, their dimensions, shape, color, concentration, distribution, which may be well-dispersed or clustered, and orientation. The stereomicroscope does not provide detailed identification of all minerals and rock types, but allows to hypothesize the presence of some lithic components which should be confirmed under the polarizing microscope. However, the presence of some inclusions such as chaff, quartz, and mica can be easily distinguished using the stereomicroscope. The nature of inclusions (lithic and mineral components, chaff, mixed) and their features (size, proportion, shape and orientation) were the primary variables for determining compositional and technological variability in the ceramic production of Arslantepe.

Arslantepe is a high mound in the Malatya plain and was always the dominant center in its region. In the earliest phases of its history – the Chalcolithic period, Arslantepe had close links with the Syro-Mesopotamian world with which it shared many cultural features, structural models, and development trajectories. But in the early centuries of the 3rd millennium BC, vast changes occurred which halted the development of the Mesopotamian-type centralized system and reoriented Arslantepe's external relations toward Eastern Anatolia and Transcaucasia.

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Chapter One: Introduction

1.1: Background to the Study

"We are interested in clay not so much for what it is in the natural state as for what it (has) become".

Rhodes 1973: 13

Pottery seems to have acquired an important social function for the symbolic identification of groups of people, and the ways in which they are circulated suggest the nature of relations and the limits of areas where the people with similar cultural connections settled and on the other hand, the existence of intercultural relations (Frangipane 2001).

The study of ceramics goes beyond their common use of providing indices by which we can analyze relationships and contacts between pottery producers and users, but also provides a potential standard in understanding the technological and compositional variability of ceramic production, in this case, those of the 4^{th} and 3^{rd} Millennium BC ceramics of Arslantepe. Ceramics have been recovered from all the periods excavated at Arslantepe, which stretch from about 4300-2000 BC. Each Arslantepe period ceramic assemblage is characterized by some unique form of specialization with a tendency towards social differentiation. This research examines ceramic samples recovered from Arslantepe Periods VIA (3350-3000 BCE), VIB1 (3000-2900 BCE), and VIB2 (2900-2800 BCE). Arslantepe Period VIA ceramics are characterized by a higher and different degree of specialization. Pottery may have now been produced within a centralized system (Frangipane 2002:128). There is a decrease in the use of vegetal temper in this period, which suggests a change in firing techniques and mass produced bowls continued to be used. Around 3000 BC, after the collapse of the Period VIA centralized system, a succession of far-reaching changes occurred at Arslantepe (Frangipane 2012:237-260). This contributed to the rise of the Arslantepe Periods VIB1 and VIB2 (3000-2800BC). At the beginning of period VIB, the classes of pottery present were significantly changed in terms of its repertoire of shapes, though maintaining the previous manufacturing techniques and aesthetic taste. The new profiles suggest a new close relationship to Eastern/Northern Anatolian and Transcaucasian cultures (Frangipane 2012:237-260).

The local dynamics and interregional contacts that provided the framework for the emergence of early complex societies and centralized economies at Arslantepe as an autonomous process was not promoted by, but only related to the so-called Uruk expansion phenomenon (Palmieri 1985; Frangipane 1993; Trufelli 1993, 1994, 1997). Algaze (1993) proposes that the formation of a network of colonial sites along the northern basins of the Tigris, Khabour and the Euphrates was due to pressure from the southern centers to perform the function of 'middlemen' in the trade between the northern areas (the periphery) and the Lower Mesopotamia (the core). This proposal was limited in theory and in the interpretation of available archaeological data. Algaze's theory is further limited by the lack of evidence that could indicate that the Mesopotamian society at the end of the 4th millennium had any economic and political institutions able to stably and regularly control the flow of goods on such a vast geographic scale (Frangipane, 1997).

Arslantepe is the largest tell in the Malatya plain and was always the dominant center in its region (Fig.1a). In the earliest phases of its history; the Chalcolithic period, Arslantepe had close links with the Syro-Mesopotamian world with which it shared many cultural features, structural models, and development trajectories, but in the early centuries of the 3rd millennium BC, vast changes occurred which halted the development of the Mesopotamian-type centralized system and reoriented Arslantepe's external relations toward eastern Anatolia and Transcaucasia (Frangipane 2014).

Fig.1a: Aerial image of Arslantepe hill, excavated areas are covered by a protective cover (Photo: Archive of the Missione Archeologica Italiana nell'Anatolia Orientale)

1.2: Geological Setting of the Malatya Plains

Turkey is a mountainous country located in the Alpine-Himalayan orogenic belt. The northern Anatolian mountains form part of the Carpatian-Balkan mountain chains and the southern part of Anatolia form the southern chains of the Alpine mountain (Atalay, 2002:29, see Fig. 1b). Turkey's landscape is shaped by tectonic plate shifts and significant volcanic activities. These activities created a virtually continuous belt of folded ranges across northern Anatolia, and the Taurus and Anti-Taurus Mountains and to the eastern Anatolia, a rugged topography. In their book on *Ancient Turkey*, Sagona and Zimansky (2009:3) indicate that volcanic activities in Turkey bring with them mineralization along the various plate contacts.

Most of these minerals occur in mineralized rocks. Extrusive volcanic activities in Turkey began in the Tertiary era and continued up to the Early Holocene era (Atalay, 2002). During the Tertiary period, lava and pyroclastic material spread to most part of the Eastern Anatolia and South-East part of Anatolia. However, getting to the end of the Tertiary and Early Quaternary, central eruptions occurred and as a result of these eruptions, volcanic cones were formed both in the Eastern, Inner and Southeastern Anatolia.

The site of Arslantepe is located in an eccentric position on the Malatya plain in the modern village of Orduzu on the western margin of the eastern Anatolian region, between the eastern part of the Taurus mountain chain and the Anti-Taurus (Manuelli, 2013:25). The Orduzu volcanics are located about 1 km east of the site and are part of the widespread Yamadağ volcanics in the Malatya region, which form the western part of the Neogene volcanism in eastern Anatolia. The Orduzu comprise rhyolite, rhyolitic dykes, trachyandesite basaltic trachyandesite dykes, and Quartz-micromonzonitic dykes. (Önal *et al.* 2008, Önal, 2008). The Yamadağ volcanics constitutes a vast volcanic sequence which mainly comprises rhyolitic lava, andesitic lava and pyroclastic intercalations, and basaltic/andesitic to andesitic/dacitic lava flows (Yalçın *et al*. 1998; Kürüm *et al*. 2004).

The site of Arslantepe lies on Miocene lake soils formed by calcareous and clayey deposits. The slope to the south is composed of fluvial-lacustrine deposits covered, locally, by conglomerates. The area towards the Euphrates is characterized by Plio-Quaternary sediments such as conglomerates not well cemented, gravels and sands (Marcolongo & Palmieri, 1983). The hills to the south and southeast of the flat are characterized by a calcareous litho-facies made of basal conglomerates and flyschoid deposits made up of calcareous marl, sandstone and marl conglomerates. The conglomerates are sometimes present in brecciated and fractured forms.

Also located at the Malatya Plain and its environment is the Permo-carboniferous aged “Malatya metamorphics” geological unit. Malatya metamorphics is composed of marble, mica calcareous schist, phyllites, slates, and recrystallized limestone. These metamorphics are deformed by the granitic and dioritic rocks that belong to Cenonian aged magmatites; fundamentally composed of granite, granadiorite, tonalite, diorite, diabase, micro-diorite, aplite, dacite, lamprophyre, basalt, andesite, basaltic pillow lava, agglomerate and pyroclastics (Sasmaz *et al*., 2014). The younger unit of the region is comprised of quaternary alluviums which covers the bottom layers with unconformity. These deposits are basically composed of non-fixed and weakly cemented silt, sand and gravel groups.

Towards the east, about 6 km from the tell, is the Maden, Baskil, and the Yüksekova complexes (Fragnoli and Palmieri, Forthcoming). The Maden complex tectonically overlies the Eocene and Miocene formations of the autochthon and differentiated by the presence of abundant volcanic rocks. Its outcrop extends widely along the southern margin of the Bitlis Massif, either directly under the Bitlis metamorphic rocks or through an intervening thrust sheet of the ophiolitic melange. The Maden Complex consists of Eocene sandstone, conglomerate, red pelagic limestone, basaltic lava, and tuff. Yiğitbaş and Yılmaz (1996) describe the Maden Complex as products of a short-lived Mid-Eocene back arc basin, above the northward dipping subduction zone between the Arabian Platform and the Anatolide-Taurides. The Baskil complex comprised Late Cretaceous calcalkaline volcanic and intrusive rocks, such as andesites, tonalites, monzonites, diorites, and gabbros (Yazgan and Mason 1988). The Yüksekova complex is a typical Upper Cretaceous ophiolitic melange with very wide outcrops in Anatolia southeast and consists in two related rock assemblages. The upper unit of the Yüksekova complex consists of calcalkaline intermediate to felsic and associated sedimentary rocks, while the lower unit consists of a chaotic jumble of basalt, gabbro, serpentinite, pelagic limestone, radiolarian chert, neritic limestone, granodiorite, sandstone, siltstone, and shale (Okay 2008:38; Yiğitbaş and Yılmaz 1996).

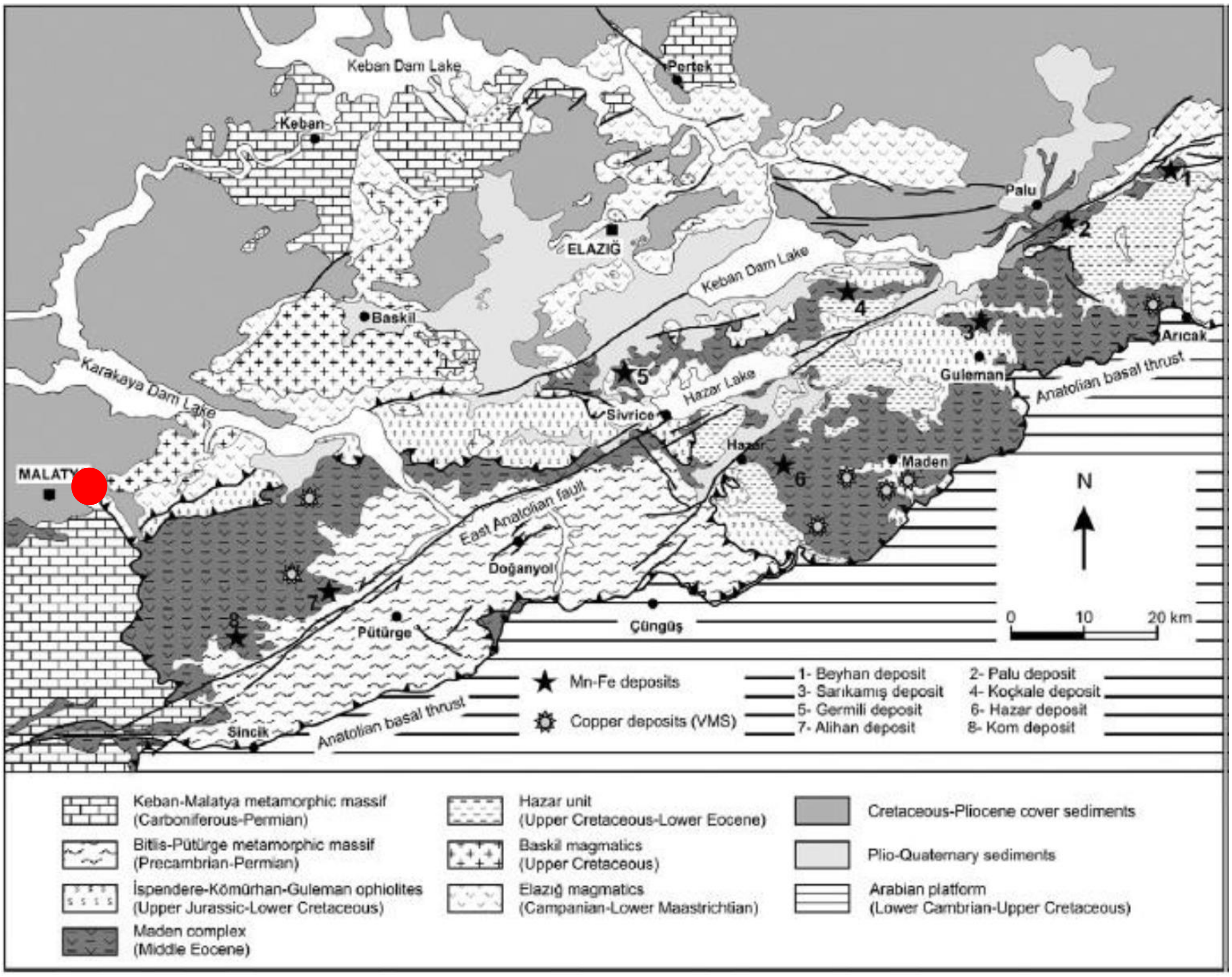


Fig. 1b: General geological map of the Elazig-Malatya region. The red dot indicates the Arslantepe site (Sasmaz *et al*., 2014). Modified

1.3: Research Aims

This research aims at defining the main characteristics of technological and compositional variability of ceramic productions in Arslantepe periods VIA, VIB1 and VIB2 (3350-2800BC). The central questions in this research are; 1. Whether variations in the paste relate to different raw material acquisition patterns and paste preparation modes – different manufacturing centers, cultural differences and agencies; 2. Is the variability in the technological choices made by the Arslantepe potters related to changes in the ceramic repertoires and types? And, 3. Does craft specialization in Arslantepe, as remarked in the highly skilled wheel–made vessels, necessarily imply craft standardization?

1.3.1: Research Objectives

The research aims has been achieved by gathering data and bibliography on the subject matter in order to understand the effects produced by different raw materials and manufacturing techniques used in the production of ceramics. A Nikon SMZ-2T stereomicroscope was used to identify and analyze the paste features, firing conditions, manufacturing processes and surface finishing on an aggregate of one hundred and fifty-eight (158) ceramic samples with the ultimate goal of determining any continuity and change within and across time in a general framework of socioeconomic and political context. Based on the analysis and characterization, the following will be established;

1. Using references of already existing systems of classification of Arslantepe ceramics by Archaeologists (eg. Frangipane and Palmieri, 1983, Palmieri, 1981; 1985), the ceramic fragments in each of the chronological phases have been described and grouped based on paste types (fine, semi-fine, or coarse) and vessel forms or types.
2. Following this, the shards were classified into paste groups/categories based on the similarities and variations identified during the paste characterization. This is an important step towards identifying the main characteristics of technological and compositional variability in the organization and production of Arslantepe pottery.

3. Finally, a comprehensive comparative analysis was made, firstly, between similar ceramic groups in different periods, and secondly, between paste categories, in order to identify the variations in paste preparation modes and technological innovations that may exist among the ceramic assemblage and the factors which may have influenced such variations.

The results, where possible, were compared on the one hand with typology of forms and functions of vessels taken from publications and drawings (Frangipane and Palmieri, 1983), and on the other hand, with results from archaeometric groupings based on petrographic and geochemical investigations already carried out (Fragnoli and Palmieri, forthcoming).

1.3.2: Research Significance

The principle of directing this research stems from the need for a comparative detailed macroscopic analysis of the characteristics of Arslantepe ceramic paste. The outcome of this inquiry will suffice as an educational reference material for further research and comparative analytical purposes.

1.4: Research Materials and Methodology

This section provides a general outline of the attributes of ceramic samples analyzed in this research and the parameters used for their analysis. This includes a discussion of the number of samples analyzed as well as the techniques used in order to achieve the ultimate aim of this thesis.

1.4.1: Research Materials

One hundred and fifty-eight (158) ceramic samples were analyzed using a non-destructive technique. The samples represent ceramic groups recovered from archaeological excavations from the site of Arslantepe; Periods VIA, VIB1 and VIB2, corresponding to the Late Chalcolithic 5 and two phases of the Early Bronze Age I respectively (3350-3000, 3000-2900, 2900-2800 BC).

The pottery samples from period VIA forms the majority of the total ceramic assemblage examined in this research (48%). The vessels are distinguishable from each other in terms of shape, characteristics of inclusions, manufacturing techniques, surface treatments, colors and firing conditions (Frangipane and Palmieri 1983: 325). The light-colored coarse vessels relate to the wheel-thrown mass-produced bowls (Fig. 2a); the light-colored, fine and semi-fine vessels comprise mainly necked jars and jars of various dimensions (Fig. 2b-c). The handmade red-black vessels include handled and handle-less bowls, small globular jars, and jugs (Fig. 2d-e). Period VIB1 pottery samples corresponds to 32% of the total ceramic assemblage. The vessels characterizing this Period are exclusively handmade red-black and monochrome burnished vessels with limited repertoire of forms. Two-handled jars are the most common shapes (Fig. 3a). Other types of vessels include the small handless jars (Fig. 3b) and bowls (Fig. 3c). Period VIB2 pottery samples form only 20% of the total ceramic assemblage examined. The pottery repertoire is similar to that of Period VIA with reference to the number of vessel categories, but shows a greater variety of typological forms. The vessel forms consist of necked jars of different dimensions (Fig. 4a-b), small pots (Fig. 4c), footed goblets (Fig. 4d), bowls (fig. 4e-f), and red-slip high-stemmed bowls (fig. 4g).

Ceramic samples from each Period were carefully analyzed under the microscope recording details from the surfaces and the clay matrix and inclusions. A number of variables were named for each shard. These include the nature of inclusions (lithics, chaff, mixed), their features (size, shape, color, sorting degree and frequency, grain size and spatial distribution of inclusions – well-dispersed, semi-dispersed, clustered), surface treatment (burnished, smoothed, slipped, untreated, decorated), and color of paste (firing conditions of paste). The maximum sizes of inclusions were measured using a 0-100μm range size reticle etched in the eyepiece of the stereomicroscope. The measured grain size on the micrometer scale was converted into millimeters in order to correlate to the ISO principle of classification and identification of soils (ISO 14688-1:2002). The frequency distributions of grain sizes were obtained by comparing the maximum grain sizes to frequency charts (see Appendix I). The exterior and interior surface colors were recorded using the Munsell soil color chart in order to maintain consistency in the assessment of color. The color and type of core of each of the shard were also identified based on Rye's (1980) classification. Both the colors of the shard surface and core can yield information about both the firing method and the chemical structure of the materials used in their manufacture (Rye 1980).

1.4.2: Research Methodology

A Nikon SMZ-2T stereomicroscope with magnification from 1 to 6.3x and a zoom of 416x was used for a non-destructive analysis of ceramic fragments from Arslantepe. Measurements were carried out on the internal, external surfaces and the sections of the shards. Digital imaging of the paste and inclusions was captured with the Nikon SMZ-745T binocular stereomicroscope equipped with a Nikon digital camera DXM 1200, and a high-density imaging technology of up to 12 million (3,840 x 3,072) output pixels. The variables described for each of the Arslantepe ceramic fragments follow the ceramic technological form developed by Fragnoli *et. al* and used successfully to macroscopically describe the pastes of ceramic fragments recovered from the Bronze Age settlement of Punta Zambrone, Calabria. The idea is to facilitate, quicken, and standardize the entry of observed data through automatic and unambiguous indication of necessary information for the classification of macroscopic paste, which could be easily used by others and not exclusively by archaeometry experts (Fragnoli *et. al*, 2014; also see Appendix ii). The ceramic technological form was modified to fit within the specific requirements of this research.

A tiny corner of each shard was carefully broken off with a snub-nosed plier to allow examination of the paste in a fresh cross- section, free of surface contamination. This, in turn, allowed the shards to be sorted on the basis of the variables mentioned earlier. Examining a fresh break permits a quick assessment of the technological and compositional heterogeneity of a collection, without significant investment of time or equipment (Rice, 2015:551).

Macroscopic analysis of shards should precede or be added to any petrographic and chemical analysis because it enables different kinds of observations and evaluation of parameters which will provide a more general view of pottery production. This type of analysis is non-destructive and is therefore a starting point for a technologically complete and scientifically relevant analysis of the ceramic production of a site in its technological and compositional variability (Fragnoli, *et. al*, 2014). The use of this technique provides vital information on the characteristics of ceramic paste and texture, surface treatments, firing procedures, traditions in the preparation of raw materials; from the selecting and preparing of the inclusions to their addition to the clay matrices. All of these evidences will support data obtained from petrographic and chemical analysis conducted on ceramic shards from Arslantepe.

1.5: Comparative Theoretical Approach

A comparative approach for studying Arslantepe Periods VIA, VIB1 and VIB2 ceramic manufacture was explored for a new interpretive framework within the general study of Arslantepe ceramics. This inquiry was attempted within an intellectual framework that considers ceramics as one of the most significant and well-preserved product of material culture which actively reflect the interactions among people (Silva 2008; Miller 2007; Dobres 2000). The groups that occupied Arslantepe during Periods VIA, VIB1 and VIB2 appear to have been different in socioeconomic terms showing varying staple economies and different customs and traditions, although sharing a number of cultural traits (Frangipane et al. 2005). The Late Chalcolithic 5 (VIA) and Early Bronze Age I settlements (VIB1 and VIB2) at Arslantepe offer an excellent basis for a comparative study of the technological and socioeconomic changes that occurred at the site as well as the 'internal' and 'external' models of interaction. The available archaeological evidence has provided advancements in the argument against the idea of the emergence of social complexity in the Upper Euphrates region as the result of a strong influence by supposedly more complex polities (Algaze 1993; Frangipane 2010).

Research in the Upper Mesopotamian and Syro-Anatolian regions have focused on the features of the first urbanization and state formation in these areas (Frangipane 1997). The arguments some scholars have proposed to suggest a one-way diffusion of culture from a more complex society in Southern Mesopotamia – the southern Uruk–oriented perspective – have placed the North at a 'margin' of the great phenomena which occurred in the southern alluvium. As well described by Frangipane (1997), this considers the southern Mesopotamian alluvium as the only formative center of urbanization and the state. The most elaborate theory that supports this interregional relation is proposed by Algaze (1993a) as a 'world system'. He views the formation of a network of colonial sites along the northern areas (periphery) and Southern Mesopotamia (the core). This interpretation, on the one hand, is able to identify the complexity and the variety of recognizable situations in the different types of peripheral sites as well as the procurement of raw materials (Frangipane, 1997), and on the other hand, it misses to face and explain the many aspects of the original local development of early state societies in northern Mesopotamia and SE Anatolia shown by the available archaeological evidence (Frangipane, 2001; Palmieri, 1985).

The study of ceramic manufacture with a careful characterization of the pastes may contribute to answering questions pertaining to, but not limited to cultural variability and cross-cultural interaction and relations. Using fabric reference groups, pots produced in a specific way and place may be determined, as well as the reconstruction of trade patterns which might be related to pottery in itself as a finished product or content. We can further explore social status and function from ceramic studies. Some types of pot were used for particular things, for example cooking, storage, eating and drinking. Comparing the amounts of different functional types can give an insight into how a site or part of a site was used. Some imported pottery were more expensive to buy than local wares, so working out the quantities of more expensive items can indicate relative wealth, thus, providing vital information on social status.

The actions carried out by the potter when manufacturing a vessel involves certain preconceived actions towards the fulfillment of a particular objective or function. Using the *technological style* and *technological choice approach* as theoretical frameworks, an attempt was made to determine the choices employed by Arslantepe potters in the Late Chalcolithic 5 (VIA) and Early Bronze 1 periods (VIB1 and VIB2) to determine variability in ceramic production within and across time (e.g., Lechtman 1977; Dobres 2000; Lemonnier 1986, 1992; Pfaffenberger 1988, 1992). Within these frameworks, I tried to determine if such choices were affected by a certain control over ceramic production by elite groups that wielded economic and political power. The technological choices that potters make along the *chaîne opératoire* define the final properties or performance characteristics of the ceramics (Albero, 2014:146). Childs defines 'technological style' as "the formal integration of the behaviors performed during the manufacture and use of material culture, which expresses social information" (Childs, 1991:332). For the archaeologists, the issue of defining technological style is vital to archaeological research, for the single subsystem of a once living culture that can be reconstructed and understood, almost in its entirety is the technological subsystem (Lechtman 1977:7). Technological style consists of patterns of non-verbal behavior in specific cultural contexts. A technological style arises from the formal integration of interrelated behaviors and activities, such as gathering resources, processing stages, altering and manipulating the resources, and the final rendering of the object. To identify a technological style can significantly help to characterize the output of a ceramic manufacturing center. The products embody the experience handed down through generations of crafts people and the technological patterns cannot be changed without implications for the success of the craft.

Potters make technical choices at most, if not all, stages of the ceramic production process and these constitute knowledge of manufacturing that may be passed on from one generation to the next. Several authors have expressed the overriding view that potters within their individual cultural context express technological choices and in doing so create a pattern that defines their time period (Lechtman 1977:15, Gosselain 1992a cited in Stark, 1999). Lechtman (1977) and Hosler (1994) have systematically identified what is termed by Thomas (2007) as 'material metaphors' that structure creative action in the technologies they investigate. Hosler's analysis of the metallurgy of pre-colonial West Mexico identifies symbolic associations of color and sound as major structuring elements in the production of a range of metallic artifact types creating what she identified as "a sacred domain of experience" (Hosler 1994: 227). Similarly, Lechtman's analysis of metallurgical surface enrichment techniques in the Andes suggested a link between weaving technologies and metallurgy through the employment of a concept linking visual appearance to structural composition that reflected basic Mochica concepts concerning the unity of appearance and character (Lechtman 1984). To identify variability in Arslantepe ceramic productions, it is expedient to perform a careful observation of the ceramic paste and typological forms since the technological choices are manifested in the finished vessels. Variability in ceramic pastes reflects a series of technological choices that are largely shaped by tradition and constrained by environmental factors (Stark 1999:28).

The link between choice and intentionality of manufacturing process remains a debated topic, since some archaeologists contend that producers consciously use manufacturing methods to delineate a group identity (Goodby, 1998; Hodder 1982b, Hodder, Ed. 1989 cited in Stark 1999), and others believe that the social information are unconsciously encoded in the manufactured goods (Sackett 1990; Leroi-Gourhan, 1993). Changes in technological choices however, are recognizable in archaeology as occurring in temporal and geographic scale. They have restricted distributions that reflect local technical systems and the shared (cultural) believes of populations of human producers (Stark 1999:29).

1.5.1: Changing Theoretical Approaches in Ceramic Studies

Theoretical frameworks structuring ceramic studies as well as other material culture range from the cultural-historical approach to the post-processual models. The *Material culture approach* was then used to place sites within a temporary framework while other aspects of human behavior were overlooked. Although this approach works fairly well in placing activities in a cultural context, much information can be gleaned from a study of this approach that goes beyond the role it plays now.

Following this, the study of ceramics became tools used to classify social interactions and cultural connections (see Phillips, 1970; Ford, 1938; and Griffin, 1952). This system of culture-historic classification is evident in the works of Rouse (1939) who provides a detailed explanation of artifact classification for the cultural-historic approach (Dunnell 1986:168). Krieger (1944) contributes to the interaction between the artifact and the archaeologist, focusing on procedure and practical issues.

The *ceramic ecological approach* (Matson 1965) which dominated ceramic studies in the 1980's (see Arnold, 1985, 1999; Kolb 1989; Rice 1984, 1996) had its theoretical roots in *cultural ecology, neo-evolutionism,* and *neo-functionalism*. This approach looked at the influence of the potter's environmental setting on his or her technological choices. That is, the identification of the roles played by the climate, landscape and geographical location in the manufacture of ceramics. Many authors (see Arnold, 1993; Matson, 1965b, 1995; Rice, 1996) suggested from the cultural ecology viewpoint that the technological choices made by the potters could respond more to environmental issues, such as raw material availability and their quality, than to social factors (Albero, 2014:129). Later, proponents of *behavioral archaeology* shared their ideology with ceramic ecologists and concentrated on ceramic production and use or performance in ethnographic and experimental settings (see Schiffer *et al.*, 1994, 2001; Schiffer and Skibo, 1987; Skibo *et al.*, 1995; Tschauner, 1996; Broughton and O'Connell, 1999:160–161). However, these approaches did not develop a sufficiently unified theoretical framework to set the theoretical agenda for ceramic studies (Schiffer and Skibo, 1997; McGuire, 1995; Stark 2003:200).

In the late twentieth and twenty-first centuries, new scientific technology and increasingly sophisticated theoretical approaches have made a more in-depth analysis possible. Chemical and mineralogical analysis can now be performed on ceramic materials to reveal a wide range of information. This approach is conveniently termed as the *Binfordians* and *Behavioral approach* (David, 1992a:336-337; Walker et al., 1995). Proponents of this approach contend that archaeology constitutes the "science of the archaeological record"

(Binford, 2001:669) and that the archaeological record is the appropriate subject of archaeological theory building (Arnold, 1990, 1991b; Binford, 1977, 1983; Longacre, 1991:1; Longacre and Skibo, 1994a; O'Connell, 1995: 206–207). Their ceramic research generally involved ceramic taphonomy, with the goal of establishing relationships concerning the "supra-cultural, mechanical, physical, and/or chemical properties of artifact production, use, and discard". This group includes some "behavioral archaeologists" (Walker *et al.*, 1995), who borrow methods from materials science and ceramic engineering and use a cultural materialist framework. Proponents of this approach emphasize the use of rigorous methodology (see Schiffer *et al.*, 2001:730–733), controlled experimental approaches, and the use of ethno-archaeological settings as actual laboratories for refining and enhancing the interpretation of data produced through the use of analytical techniques.

1.5.2: Discussion

In this thesis, I attempt to integrate both passive and active conceptions of *technological choice* and *technological stylistic approach* into my interpretation of technological and compositional variations that may exist among the Arslantepe ceramic assemblage. Though the majority of these approaches use a combination of archaeology and ethnography, it is possible to understand, to some extent, the choices made by prehistoric potters without the added benefit of comparison to their modern counterparts. I agree with Thomas (2007:206) that the *technological stylistic* approach has been effective in exposing underlying structural properties of technologies that are culturally specific and recognizes that the cultural meaning and use of artifacts are bound to the ways in which material properties and production processes are structured. This approach can therefore be very effective in expressing social, political or ideological boundaries. I also incorporate an analysis of the *technological choices* of the Arslantepe Periods VIA, VIB1 and VIB2 ceramic assemblage by observing the pastes to identify the nature of inclusions and their features, and other secondary variables such as paste types, colors, and surface treatments. With an understanding of all these variables, the research aim and questions can be answered.

1.6: Structure of Thesis

This research is divided into five chapters. The first chapter provides a general introduction to the research. Chapter 2 consists of a review of related literature and bibliography on the subject matter and the archaeological background of Arslantepe Periods VIA, VIB1 and VIB2 to familiarize the reader with the site and chronological phases. Chapter 3 gives a detailed presentation of the data gathered in the analysis of the ceramics and a discussion of the results. Chapter 4 presents a comprehensive discussion of the results. The final chapter; 5 consists of a summary and conclusion of the research.

Chapter Two: Literature Review

2.1: Archaeology of Arslantepe Periods VIA, VIB1, and VIB2

The Arslantepe settlements cover a long and detailed sequence of Late Chalcolithic, Early Bronze, Middle Bronze, Late Bronze and Iron Age levels (Di Nocera 1998; Frangipane 1993a cited in Frangipane 2012:971; Frangipane 2011; Frangipane 2012 a and b; Frangipane, Liverani 2013; Manuelli 2013; Puglisi, Meriggi 1964, also see Tab.9). The long and continuous occupation of the site clearly related to favorable conditions for agriculture, in an alluvial plain rich in springs and watercourses. Excavations revealed that the Arslantepe site played a central political and economic role in the region, controlling surrounding territories and relationships with other Near East regions (Angle *et. al*, 2002:43-71; Frangipane ed. 2010). Its long history which has been brought to light over more than fifty-five years of excavations by the Italian Archaeological Mission of the Sapienza University of Rome, very clearly reflects the history of the whole area as well as the complex events that marked its developments and changing relations with various and different civilizations of the Near East.

2.1.1: Arslantepe Period VIA (Late Chalcolithic/Late Uruk, 3350-3000 BCE)

Period VIA marked the zenith of the economic and political centralization of Arslantepe. A wide and monumental complex of public buildings was built up with new and most probably original features making up a series of interconnected buildings (Frangipane, 2012a). Unlike preceding periods in the 4th millennium BC, there was a clear distinction of economic and administrative activities from ceremonial and religious activities in period VIA. Administrative and economic activities seemed to open to the broad section of the population, while ceremonial and religious activities were the reserve of smaller and elitist sectors of society (Frangipane, 2010b). The architectural complex of this period was expanded and changed to meet the increasing need of the population as well as creating a distinction in the various activities on the new central institutions. Frangipane (2012) conveniently terms this complex as a "palace" which is not in the literal definition of the term, but as a complex architectural space in which multiple public activities were performed by the central institutions in the distinct but interconnected building.

The pottery was mostly wheel-made, fine, relatively well-fired, and pale in color, and was strongly influenced by the Mesopotamian models of the Late Uruk culture, though retaining typically local features (Frangipane 1993b, 1997, 2002; Frangipane and Palmieri 1983). The mass production of pottery was restricted to conical wheel-made bowls, which were now mass-produced on the fast wheel. However, in addition to the wheel-made production derived from the Syro-Mesopotamian Uruk culture, a variety of other production styles characterized the Period VIA pottery. A type of red-black burnished vessels had now become established at Arslantepe. The red-black burnished vessels were a completely different type of production with a different technology; mainly hand-made manufacture, mineral and chaff inclusions, a peculiar firing technique, a different surface treatment, and a very different aesthetic taste with respect to the prevailing wheel-made vessels and the kitchen ware of Arslantepe VIA. They showed closer affinities with Central Anatolian elements, tastes, and typological models (Frangipane, 2001:979-980; Palumbi, 2008:80).

The development of a powerful system of centralized political and economic control on a site that never actually became "urban" in a literal sense of the term shows that whereas Arslantepe played an important and active role in the state formation process in connection with the Mesopotamian world, it also followed its own specific and different development pattern, which was less well entrenched than those of the highly urbanized environment (Frangipane 2009).

2.1.2: Arslantepe Period VIB1 and VIB2 (Early Bronze I, 3000-2800 BC)

Around 3000 BC, a devastating fire completely destroyed the palace complex associated with period VIA leading to the collapse of the Mesopotamian-type centralized system and now, an establishment of relations with the northeastern Anatolian and Transcaucasian world (Frangipane and Palumbi, 2007). All vestiges of the centralization, typical of the previous social-economic structure disappeared and profound economic and cultural transformations took place. Both building structures and pottery production radically changed (Angle, *et. al*, 2002:43-71; Frangipane 2012b).

Period VIB1 (3000-2900 BC) marks the first phase of the Early Bronze I and was characterized by seasonal settlements of groups of transhumant pastoralists who may have previously been travelling around the region. They probably formed a system of relation with the eastern Anatolian and Transcaucasian world, with which they shared customs and cultural features (*Ibid*.). They settled in scattered wooden huts built using the wattle-and-daub technique and leaving wide open spaces where long rows of posts have been found (Palumbi in *Origini XXXIV*, 2012). The red-black and monochrome burnished vessels became the dominant class of pottery during this period. It was exclusively handmade, red-black in color, and burnished. It was made using identical firing techniques and identical aesthetic standards to those of the Late Chalcolithic *Red-Black* Ware; black was always used on the most visible surfaces of the pots (Frangipane, 2001, 2012:237-260). However, new shapes were adopted that were suggestive of the repertoire belonging to the Transcaucasian culture (Palumbi, 2003, 2008a:223-235).

The second phase of the Early Bronze I, Period VIB2 (2900-2800BC) was evidenced by the coexistence of two groups and the two cultural horizons. New forms of relations seem to have been reestablished with the Mesopotamian-related post-Uruk cultures of the Middle and Upper Euphrates, perhaps transforming in new ways the power of the former elites or as a result of the introduction of a new political system and leadership (Frangipane, 2001:981). There was a revival of mud brick construction traditions and the wheel-made light-colored pottery and reserved slip productions of the Uruk origin. The pottery in this period seems to resume the earlier Late Uruk traditions, retaining and to some extent modifying some peculiar features, while introducing new traits (Frangipane and Palmieri, 1983:542; Frangipane, 2001: 981).

2.2: State of the Art–Mineralogical and Petrographic Analysis of Arslantepe Ceramics

Extensive mineralogical characterization and petrographic analysis have been carried out on ceramic shards from Arslantepe over the years by researchers who sought to characterize and identify variances in production and technological framework among the long structured period of settlement in Arslantepe (Angle, Morbidelli, and Palmieri, 2002:43-71; Fragnoli and Palmieri, forthcoming). This section provides a summary of the results obtained from the mineralogical and petrographic analysis.

In their work; "Pottery from Arslantepe (Malatya, Turkey): petrographic features and archaeological data", Angle, *et. al* (2002:43-71) used discriminating factors of mineralogical components and subordinately, the lithic nature of rock fragments occurring within the shards to create distinct groups. More than one factor indicates that, in the Arslantepe site, well established production technology for functional ceramic objects existed for specific pot classes and periods. With these results, the authors therefore concluded that the identification of some paste categories closely associated with various classes of pots shows how different types of production took place in Arslantepe. The results therefore confirm that wheel-made and red-black productions are different, and further suggest that they may have been more than one workshop that operated on the site. Technological aspects were probably managed by different potters whom, although making wheel-made and red-black products, did not work together.

Pamela and Fragnoli (Forthcoming) performed petrographic and geochemical investigations on 4th to 2nd millennium BCE ceramics from Arslantepe with the ultimate goal of establishing technological continuity, innovation and cultural change. This discussion is limited to a summary of results obtained from the petrographic analysis. The investigation identified critical differences in raw material procurement and paste preparation, reflecting typological, chronological and cultural changes. Based on these differences, distinct modes of production that correspond to phases reflecting significant social, economic, and political changes were recognized. The petrographic analysis was aimed at classifying thin sections by a degree of similarity into homogeneous reference groups which represents the ceramic pastes prepared in a specific way and place and allow for the comparison between petrographic groups and typological and functional classifications. Variability regarding paste composition, preparation, and firing were observed and reduced to some fabric groups based on three discriminating features: 1) Ca-rich versus Ca-low fabrics; 2) the presence/absence of vegetal temper; 3) the type of mineral or rock inclusions, which may be of volcanic, plutonic or metamorphic origin. From these discriminating features, 19 petrographic groups emerged. One more petrographic group characterized by grog tempering was added.

Considering the discriminating factors, the authors identified a general diachronic trend by first relating the three main discriminating criteria to the different Arslantepe phases. The incidence of calcareous and vegetal components throughout the sequence provided evidence for three distinct phases. The first one corresponded to periods VII and VIA, when straw-tempered calcareous pastes prevailed; during the second phase; periods VIB1-2, non-calcareous pastes, to which plant fibers were still added, were frequently recurring; and the third phase, that started from period VIC but gained importance in period VID, was characterized by calcareous pastes lacking in organic matter. By considering the third discriminating criterion, namely the geological environment in which inclusions formed, similar diachronic tendencies were observed. During periods VII-VIA, mostly plutonic and volcanic outcrops were exploited, during periods VIB1-VIC metamorphic rocks were predominant, and from period VID1 the use of volcanic formations became almost exclusive.

In reference to the organization of ceramic production, it was identified that clear differences existed when they related the petrographic groups to the different ceramic classes in each of the chronological phases. Period VII was characterized by the almost exclusive use of calcareous pastes rich in plant fibers. Volcanic inclusions were recurrent in tablewares, while cooking pots mostly contained plutonic rocks. In Period VIA, the calcareous pastes tempered with lavas and straw were still present. However, alongside this continuity, a technological change occurred which saw a lack of organic temper in the calcareous paste of some fine jarlets thrown on the fast wheel. The handmade burnished ware did not show any recurrence in raw material supply and paste preparation. However, in Period VIB, non-calcareous straw-tempered pastes coupled with metamorphic rocks became frequent and the handmade burnished wares now formed well-defined petrographic groups, while wheel-made productions present calcareous pastes lacking in plant fibers and containing basic to intermediate lava. From period VIC, the use of non-calcareous straw-tempered pastes considerably increased and appeared in most of the painted productions and the handmade burnished ware shows a break with the past as it was tempered with grog and plant fibers. Finally, in Period VID, calcareous pastes with lavas characterized the whole painted production of the Malatya plain without any exceptions and variants. The the handmade red-black/dark burnished production was now represented by pastes rich in andesitic lavas. Based on these results, the authors concluded that all the identified minero-petrographic assemblages were compatible with local formations Differentiated supply and production modes revealed according to chrono-cultural phases and ceramic classes as well as the changes and continuities in technological choices echoed economic, political, and social changes that existed on the site and its surrounding environment.

2.3: Background to Ceramic Analysis

The appearance of pottery vessels in the archaeological record has long been considered a major marker in human “progress.” From the beginning of archaeological classification in the first half of last century, pottery was seen as part of the “Neolithic techno-complex”: an assemblage of tools for obtaining, preparing, and storing food, plus the associated technologies of their manufacture and use, that accompanied changes in life-ways during the Pleistocene/Holocene transition. These changes included the adoption of food production rather than collecting, along with settlement in permanent villages instead of temporary encampments. In contemporary thinking, these transformations have been decoupled and each is seen as highly complex, occurring over several millennia and at different times and in different ways in different areas (Rice, 2015).

The production of ceramics involves several processes, from obtaining the raw materials to manufacturing and finally cooking. These operations, which are summed up in the production technology, have been transformed in many ways over time as they respond to historical and socioeconomic changes. As suggested by Stark (2003), the selection and preparation of the clay material, the first stage of the *chaîne opératoire*, has been the subject of many archaeological studies. The vast variabilities that occur in clay pastes may be dependent on the communities of the potters (Longacre et al., 2000). These variables can be very small; other situations of variability can arise from the need to modify paste composition to improve the ware's resistance to thermal or mechanical shocks (Roux, 2007 cited in Scarcella; ed. 2011).

The mechanisms underlying the variability of ceramic assemblage can be understood by elucidating the processes through which the various stages of manufacture have been established. In such a case, one considers not the socioeconomic explanatory factors, which may vary depending on the situation, but the mechanisms underlying the establishment of technological procedures which may sometimes be universal.

Roux (2007) outlines three important guidelines for studying of archaeological ceramic assemblages. She suggests that ceramic studies should begin with the combined study of technical processes and characteristics of the objects (forms and decorations). This is essential for their anthropological interpretation, since considering the objects only, while ignoring the technical process for producing them undermines sociological and historical information essential for understanding their variability. Secondly, the synchronic variability of the *chaînes opératoires* can be indicative of distinct social groups to the extent that these differences cannot be ascribed to factors of a functional nature. These social groups are those of the producers, bearing in mind in any case that the consumers can make use of vessels manufactured by producers belonging to groups different from their own. Finally, the diachronic variability of the *chaînes opératoires* reveals the transformations undergone at each stage of the *chaîne opératoire* over time, thus reflecting the history of social groups in terms of the external and/or internal evolution of their material culture.

In agreement with Rice (2015:183), most pottery is a mixture of clay and non-clay constituents. The latter may be naturally present in a clay deposit or purposefully added by the potter to modify the clay's properties. Inclusions in any clay body play significant roles during all steps of pottery manufacture, in the forming, drying, and firing phases. Natural clays are usually mixtures of clay minerals and non-clay mineral components occurring in a range of grain sizes. Coarser particles or clasts, typically angular to sub-angular in shape, are common in primary clay deposits located relatively near their parent rock. Clasts may vary from pebble-sized (>4mm) to gravel-sized (2-4mm) and sand, silt and clay size ranges (<2mm). The predominant sand and silt-sized mineral in the clay is usually quartz. However, sands also may be calcium carbonates, volcanic, or a mixture of many materials, including accessory minerals such as micas, feldspars, hornblende, and ferric material (often occurring as finely particulate coatings on the larger grains). The coarse material in natural clay is largely responsible for the property known as texture: the proportion, size, and shape characteristics of the grains in a clay material (Rice, 2015:184). Three kinds of mineral grains, quartz, feldspar, and calcium-based minerals, are particularly common in ceramics, whether naturally present in clay or added by potters. Of these, the most common is free crystalline silica (SiO2). Silica is important in determining the physical and mechanical properties (shrinkage, porosity, strength) of clay bodies.

Potters add varied materials to their clay mixtures to modify the plastic and performance characteristics. These additions, commonly referred to as temper is intended to modify plasticity, workability and porosity; reduce drying time, shrinkage, and deformation and improve firing behavior (Rice, 2015:194). Temper is defined as the most common and/or largest aplastic in the paste. According to Rice (2007: 411), an *aplastic* is particulate matter in a clay body that does not contribute to plasticity or that reduce the plasticity of the clay but lacking implications of either natural occurrence or deliberate addition by the potter.

Tempering materials can provide information about the raw material procurement pattern, paste preparation modes, place of production, and the cultural ecology. Several writers have stated that any substance, ranging from minerals to organics can be added to clay to modify its properties at any stage before drying to form an object (Rye, 1981:31-36;

shepard 1976: 26-27). Lithic and mineral tempers are more common. These components may derive from sedimentary, metamorphic, and igneous (volcanic and plutonic) environments.

2.4: Paste Analysis

The distinction between deliberately added and naturally present materials in a paste can be problematic in ceramic analysis. Stoltman suggests four characteristic features which are usually considered in addressing this issue; the identity of the substances and the particle shape, size range, and the amount present (Stoltman 2001: 301–305). Paste texture is influenced primarily by non-plastic inclusions: amount, grain size, grading, and shape. Grain size and porosity of the clay also affect the texture (Shepard, 1956:117). Variations of texture are limited by the requirements of a sound vessel, by the potter's standards, and by the characteristics of certain tempering materials. Differences in grain size depend on the nature of the tempering material and on the potter's method of preparation. Some materials are used in their original condition while others are ground, crushed, or pulverized.

The categories of inclusions that can be stated clearly to have been added to clays rather than occurring naturally are grog; angular fragments of crushed fired clay, quantities of volcanics, and many kinds of organic matter (Rice, 2015: 205). Tephra – ash, sand, crushed pumice, may be naturally present in sedimentary clay deposits, typically in small amounts because this material is fine particulate and decomposes. Vegetal matter (chaff) may or may not be a natural constituent. Organics typically burnt out of a fired clay object and are identified instead by their casts and the considerable pore space they leave in the fabric (large quantities observed in Arslantepe ceramic assemblage). Domesticated plant materials such as wheat chaff are almost certainly added, but rootlets and other detritus might be naturally occurring in a recently exposed or near surface deposit (Rice, 2015: 204). On the other hand, quartz and calcite sand, mica, shell, and sponge spicules often occur naturally and abundantly in clay deposits, depending on their formation processes. Mica, both biotite and muscovite are the most common constituent of clayey sediment; it is not likely to have been added as temper unless the particle sizes and quantities are large. (Rice, 2015:205). Mica may remain in primary clay deposits after weathering from a parent rock, and at times might be present in considerable amounts. Shepard (1976:162) suggests that when mica is abundant in pottery, it is likely that the vessels were made from micaceous clay or clay tempered with crushed micaceous rock rather than being tempered with mica alone.

The shape of the particles and the size of the mineral inclusions can give suggestions to the depositional origin of the clays and the inclusions' origin. When the grains are angular, they are usually interpreted as crushed rock and therefore that the mineral was added. A rounded or spherical grain on the other hand is often interpreted as the cause of abrasion from wind, stream, or wave action during transportation. As suggested in her book, Rice (2015:207), defines granulometry as the consideration of the range of sizes and shapes, and their distribution in the ceramic paste of individual mineral constituents is informative. A clear division in the frequency distribution of coarse and angular fragments versus small and rounded particle sizes may suggest that the coarse, angular particles were added to fine sandy clay. On the other hand, if all particles are in the very fine sand-to-silt size range, it is more likely that they were naturally present in the clay deposit.

2.5: Firing and its effect on the paste

Firing involves the application of heat to the formed and dried vessels, results in the chemical transformations of the clay body by producing a hard and durable product that has lost the plasticity. The appearance and structure of a vessel at the end of the firing process is determined by factors such as the maximum temperature attained, the duration of firing, and the firing atmosphere (Rice, 1987:81, 2015:231-232).

Fired ceramic wares are generally distinguished on the basis of temperatures attained during firing (Sinopoli, 1991:28-29). Low temperature fired vessels turn to be more porous and coarse than those vessels fired at higher temperatures. It is also worthy to note that along with these temperature differences, ceramic wares may also be distinguished by the raw materials used in their production (Rice, 1987:5-6). The clays also undergo chemical transformations during firing and such transformations are dependent on the firing temperature and mineralogical makeup of the clay. The inclusions and impurities in the clays may also undergo transformations during firing.

Differences in the firing atmospheres may be defined on the basis of the presence or absence of air circulation. When oxygen is present in the firing chamber, an oxidizing atmosphere exists; if little oxygen is present, a reducing atmosphere exists. The firing atmosphere affects vessel color, hardness, porosity, and shrinkage (Rice, 1987:81). Firing atmosphere can be controlled by potters in a number of ways. Firing facilities may be sealed so that less oxygen enters the chamber, or they may be open, allowing free flow of oxygen. In addition, firing atmospheres may change throughout the course of a firing with difference in heating and cooling atmospheres controlled in order to affect vessel color (Sinopoli, 1991:30-31; Shepard, 1956). Where abundant oxygen is available, carbon present in the vessel body and fuels are fully consumed, and the vessel becomes light in color. Black or dark brown vessels are typically produced in a reducing atmosphere. In these oxygen-poor atmospheres, the carbon in the vessel body is not lost, and carbon from fuels may be deposited on the vessel surface, producing a pot that is dark in color. Vessel color may differ from the core to the surface depending on the firing and cooling conditions and the degree to which organic materials are fully oxidized. Incomplete oxidation of carbon leads to the dark core of ceramics fired to relatively low temperatures for short periods and in very fine-textured pottery (Rice, 2015:247). In addition, surface color may vary in a single pot, if some areas of the firing facility were exposed to greater oxygen than others.

Surface finishing treatment refers to deliberate alterations potters make on the external, internal or on both surfaces of a vessel. Surface treatments are usually applied when the vessel is partially or completely dried. According to Shepard, the method of surface finishing depends on the purpose of the vessel and whether or not it is to be decorated. The finishing may be completed in one process immediately after shaping and while the clay is still plastic, or it may not be completed until the vessel has become leather-hard or dry (Shepard, 1956:65). With reference to Arslantepe, ceramic fragments were burnished, smoothed, slipped, and more rarely, decorated and untreated. The untreated surfaces were present in moderately rare quantities and occasionally showing scrape marks or traces probably left behind by the tools used to collect excess clay from the vessel. Regarding decorated shards, horizontal and oblique incised and dotted decorative patterns probably created with a sharp pointed tool were observed on only two shards from the whole ceramic assemblage. The external surfaces of some of the shards were also self-slipped, causing a smoother surface. Smoothing is mostly related to the external surfaces of Arslantepe shards. Manuelli (2013:80) associates this limitation to the difficulties that potters may have faced with hand-treating the internal surfaces of vessels with narrow necks. The farthest an interior smoothing can go is to the rim and interior of the neck. Slip is mostly present on the external surface and provides the vessel with a thin homogenous layer different in color from the body. Slipping was done by the partial or total submersion of the vessel in a fluid suspension of fine and diluted clay, creating a plain and smooth surface, covering the original color of the vessel (Manuelli 2013:80). Burnishing is produced by rubbing the surface of the leather-hard vessel with a hard object, which will in effect compact and reorient the clay particles to seal pores or reduce permeability. Burnishing is realized by the use of tools such as a hard or smooth instrument, leaf, pebble or smooth stone. It then produces a surface luster on the vessel and creates a narrow parallel trace or a pattern.

2.6: Relationship between Ceramic Manufacture and Use

The intended use of a vessel affects the final form the vessel will take in a number of ways. For instance, the material constituents of the vessel may be selected on the basis of its intended use. Certain tempering materials or clays may be favored for cooking pots, whereas others are favored for liquid storage vessels, and luxury or ritual vessels may be made of other materials (Sinopoli, 1991:83).

Several studies on pottery raw materials show that the characteristics of cooking pots often differ from those of non-cooking pots (Mills 1984). Many of the differences seem to be due to the need to increase the ability of cooking pots to resist thermal stresses associated with repeated heating and cooling. Potters may take a number of steps in order to increase the resistance to thermal stress. These include increasing the size and quantity of pores through the addition of organic materials or angular irregularly shaped temper particles; or adding tempering materials that have similar expansion rates of the clay body of the vessel, such as fine-grained clays or minerals like calcite, plagioclase, and feldspars (Sinopoli, 1991:84). The distinct patterns in raw materials evident in locally produced and contemporaneous ceramics from a site or region may be related to differences in the uses of the vessels. Potters make vessels in certain shapes for certain uses. For instance; narrow-necked vessels are likely to be used for transporting liquids because of the limited spill from their openings than from wide-mouthed vessels. Round bases are advantageous for cooking vessels because they transmit heat easily and are less susceptible to breakage from thermal stress than flat-based vessels. Sinopoli (1991) and Rice (1987, 2015) however, caution that this notion does not always mean all vessels are ideally suited to their intended use. Vessel shape may also be determined by normative ideas, fashions, and the technology of ceramic production and the technology of ceramic production.

2.7: The issue of Ceramic Paste Standardization and Specialization

Specialized production has been conceived to entail fewer workers in a society, who are individually more skilled and who, in aggregate, produce more vessels for a larger corpus of consumers, with greater efficiency, under conditions of reduced time and labor investments. Rice and other authors originally viewed standardization as a process of reduction in variability as pottery making became a specialized labor through time (Rice 2015:732, Rice, 1981, 1991a, 2015:733; Shepard, 1958:452). However, Rice (1981, 1991) and Costin (1991) have also recommended caution since the link between 'specialization' as a general concept and the attributes of pottery may be often speculative. They both suggest a comprehensive framework for thinking about the different types of specialization and organization of production, and argue that the production organization should not be reconstructed from a single measure.

Paste standardization has been hypothetically related to three potential transitions in the establishment and development of specialized pottery production (Rice, 1981, 1991; Costin, 1991). By definition, the initial transition from non-specialized to specialized production occurs when potters first begin producing pots for distribution outside of their own households. Second, increased skill and routinization may lead to a highly efficient technology and this may result in standardization. Third, the state institutions or other empowered elite groups may take control of production and restrict access to resources. A restricted resource base, presumably means reduced chemical and mineralogical variability in ceramic raw materials in comparison with non-elite controlled resources, and this change results in pastes with greater homogeneity (Arnold, 2000). Although, these hypotheses can explain paste standardization to some extent, they have induced many questions about the relationship between paste and production. An important concern here is if these hypotheses validate questions of how the analyses of ceramic pastes inform about the degree of specialization; if variability in ceramic pastes indicates differences in the organization of production and if the evolution of production, as expressed in these hypotheses indeed lead to standardization of pottery pastes; and finally if the elite control over access to resources necessarily lead to reduced variability in pottery pastes.

Arnold (2000:334-335) suggests that the answers to these questions lie in addressing a more fundamental question of the causes of paste variability and how such variability relate to the potters' behavior. In order to do this, he proposes a comparative ethno-archaeological perspective. One can holistically interpret the social implications of paste variability in antiquity when raw material selection, procurement, and preparation are understood in present-day societies. However, this assertion is not to say that the contexts of the present and the past are the same, but rather that ceramics require some common outline that can be known and understood by virtue of the similar behavioral patterns required for their production, whether produced in the present or in the past. By understanding these processes, as well as the social and technological patterns required for their execution, one can come to understand the social dimensions of ceramic production more clearly and therefore improve the validity of one's inferences about the past (Arnold, 1976, 1985, 1993).

Although few studies explore the variability of raw materials and the selection criteria of contemporary potters (e.g., Arnold, 1971, 1972b, 1993; Gosselain, 1994; Rye, 1976), much less is known about the social context of raw material selection and procurement. Taking cues from the ethnographic literature about the social dimensions of paste variability is difficult because paste variability is interrelated in a complex way with geological variability, patterns of raw material procurement, and methods of paste preparation (Arnold, 1985; also see Kolb, 1976, 1989a, 1989b, 1991, 1997). Relatively little investigation has been directed toward standards of non- metric attributes of pottery, such as composition — an index of resource specialization. These have been based primarily on INAA analyses (Rice 2015:736; Stoltman 2001:318–19). Arnold's comparison of paste composition in several pottery-making communities reflected changes in resources, but he concludes that, with respect to the question of what composition "can tell us about the organization of ceramic production," the answer is "not much" (Arnold, 2000: 361-369). He further stated that the factors that affect paste variability are multidimensional and multi-causal. They include the natural mineralogical and chemical variability in the raw materials and the number and distribution of raw material sources across the landscape. Also, procurement variables such as the potter's perception of suitable raw materials, the potters' settlement pattern, the distances to sources, land tenure, religious factors, and change in resources over time can influence paste variability. Potters sometimes have to experiment to find suitable clay; modification of raw materials by screening or grinding can affect paste variability, as can the ratio in which raw materials are mixed to form the paste.

Chapter Three: Presentation of Data

3.1: Methods

An aggregate of one hundred and fifty-eight shards (158) were analyzed for this research. The description of the shards follows previously defined ceramic classes by archaeologists for Arslantepe ceramic assemblage (Frangipane and Palmieri, 1983). Within this system of classification, sub-groups forming paste categories were created based on the similarities and variations in the nature of inclusions, their features and the paste texture. The nature of inclusions (lithic and mineral components, chaff, mixed) and the paste texture (size, proportion, and shape – “fine texture”, “medium texture”, “coarse texture” and “very coarse texture”) were considered in creating these paste categories with the ultimate goal of determining raw material and paste preparation modes. Seventy-six samples were analyzed from Arslantepe Period VIA comprising 48% of the total ceramic assemblage. Fifty (32%) and thirty-two (20%) samples were analyzed for Period VIB1 and VIB2 respectively.

In the current analysis, only shards from Periods VIA, VIB1, and VIB2 forming a universal class of light colored, light to pale colored, handmade red-black burnished, and kitchen pottery were examined. A total number of 158 ceramic fragments were analyzed using the stereomicroscope in a reflectance mode at a magnification of 10x–63x. The ceramic fragments from Period VIA were mostly wheel-made (37%), their pastes were fine to coarse, relatively well-fired, and light colored. The ceramic assemblage also comprises a class of hand-made, red-black burnished shards (8%) and shards of the so-called kitchen pottery (3%). Period VIB1 shards were exclusively hand-made, red-black burnished with fine to coarse pastes (25%). Also observed were some monochrome burnished shards (6%) and rare gritty fine black burnished shards (1%). The Period VIB2 ceramic assemblage was characterized by wheel-made shards (20%) with fine to semi-fine pastes. The shards were well-fired and the colors were mostly dominated by pale to buff colors with some brownish-orange and red-slipped shards.

A number of variables were distinguished for each fragment. These include surface treatment and finishing, surface and paste colors which are indicative of firing conditions, nature of inclusions and paste texture. The paste texture was described based on the proportion (%), size (mm), and dimension of the inclusions. These features were defined through visual comparative charts (see Appendix i, ii; also see Fragnoli *et. al*, 2014) and the maximum sizes of inclusions were measured using a 0-100μm range size reticle etched in the eyepiece of the stereomicroscope (eyepiece scale) taking into account the texture categories of the whole assemblage of shards. The inclusions in the clay are generally responsible for the paste texture. In reference to the definition of Rice (2007: 411; also see Chapter 2.4), it is often impossible to macroscopically distinguish between naturally occurring temper in the clay and those added by the potter to decrease plasticity or affect workability. Due to these difficulties and in agreement with Duistermaat (2008), a neutral term "inclusions" will be used to express all organic, lithic components, and mineral materials present in the pastes, while avoiding the misleading terminology "temper". Inclusions in the pastes of the ceramic fragments were described based on their sizes, proportions, and shape characteristics.

The majority of the pastes from Arslantepe Late Chalcolithic 5 (Period VIA) and Early Bronze Age I (Period VIB1-2) were made with mineral and lithic inclusions of different forms and sizes. Organic inclusions were also used even if they appeared in moderate frequencies. In the description of the inclusions, attention was paid to the sorting degree in the paste. Where the inclusions are very fine and there are no vast differences in the shape and sizes, they are described as uni-modal and the assumption then will be that the inclusions are naturally occurring. On the other hand, if the paste presents a number of large, rounded or angular inclusions in a matrix containing only small, angular or rounded inclusions, they are described as bimodal or polymodal, hence the assumption that the larger materials are deliberately added to the paste by the potter. According to Gibson and Woods, any ceramic fabric can be described as bi-modal or polymodal if the larger opening materials occur in a different size range from the smaller ones and there is little overlap between them (Gibson and Woods, 1990:31).

Prehistoric potters added many different materials to clay to make their vessels. These materials ranged from organic materials such as vegetal fiber to artificial materials made by humans, such as grog (crushed ceramic) and rock fragments from igneous, metamorphic to sedimentary types. The choice of inclusions was influenced by several factors, including their availability in the immediate surroundings of the site, the vessel function and shape, the effects the inclusion may have on the ceramic pastes in relation to color, thermal resistivity, plasticity and workability. Beyond the *Functionalist*, *Ecological*, and *Technical* perspectives for the selection of inclusions, the social significance of ceramic production may also play a significant role in the potter's choice of inclusion type. According to Gosselain's report on pottery production from Cameroon, the way potters select their inclusions and prepare the pastes is first related to the social phenomena linked to certain systems of knowledge transfer (Gosselain, 1994). The Arslantepe potters made varied choices when it came to the selection of inclusions. These choices ranged from the selection of mineral and lithic inclusions of various sizes as well as the addition of organic materials in the form of chaff. In addition to the description of inclusions for each shard, their sizes, their shapes and frequency percentage were recorded. Generally, grain sizes of inclusions are expressed as very fine, fine, medium, coarse and very coarse. For this analysis, the inclusion sizes were expressed in the following size descriptions:

- Very fine: Grain sizes measuring up to 0.5mm
- Fine: Grain sizes measuring from 0.5-1mm

- Medium sized: Grain sizes measuring from above 1-2 mm
- Coarse: Grain sizes measuring from above 2-4mm
- Very coarse: Grain sizes measuring from 4mm and above.

This size range was necessary because the inclusions identified in the pastes have broad variety of grain sizes and therefore the need to provide a best fit range to record them. The incidence of inclusions was described as very frequent (>25%), moderately frequent (25-15%), moderate (15-5%), rare (5-1%), and sporadic (1–<1%). It is important to state that the macroscopic technique used to investigate the pastes does not assume the ultimate role of petrography, hence it does not provide detailed identification of all mineral and lithic inclusions. However, some lithic and mineral inclusions can be easily described using the stereomicroscope. Those lithic and mineral components that could be defined with certainty in the pastes were described based on their nature and features, while those that could not be defined were described and broadly classified as "grit" (Tab.3). Four main categories of inclusions were determined with certainty in the pastes. They include quartz, mica (both muscovite and biotite), schist, and chaff. The other inclusions which could not be determined with certainty were also described based on color, shape, and other visible characteristics and named as grit 1, grit 2, so forth for purposes of differentiation.

Quartz is the second most abundant rock-forming mineral with fine particles that range from sub-angular to sub-rounded elongate in shape. It usually appears colorless, transparent or white and translucent, as in milky quartz. Quartz occurs in nearly all silica-rich sedimentary, igneous, and metamorphic rocks. Quartz was identified in the paste as fine to medium-sized and sometimes coarse-sized sub-angular white-colored to translucent inclusions, but sometimes appearing as colorless glassy inclusions. Mica is a common rock-forming mineral which usually appear colorless or silvery white-colored (muscovite) but can also be brown-colored, dark-brown (biotite), light gray, pale green, or black-colored. They appear as splitting thin sheets, lamellar scaly aggregates or disseminated grains and occur in igneous rocks, metamorphic rocks and some fine-grained sediment. Mica (muscovite and biotite) was identified in the paste as silvery white-colored thin sheets and brown to black-colored lamellar scaly inclusions that reflect lustrous color under light. Schist is a metamorphic rock that has a flaky and foliated texture with distinct layering of light and dark-colored minerals, but mica is usually present (Bonewitz, 2012:291; Price & Walsh, 2005:78). Schist was identified in the paste as dark, foliated, medium to coarse-sized inclusions. Last but not least, vegetal materials were identified in the paste by the spiky, elongated voids or vughs left behind by burnt out vegetal matter (chaff). On the surfaces of the shards, they were identified by straw-like impressions.

For the purposes of this analysis, grit has been designated to a number of different unidentified inclusion categories occurring in the paste. Grit 1 appears in the paste as fine to medium-sized brownish to red-colored inclusions with sub-rounded to round-elongate shape, providing an earthy luster. Based on the description, petrographic groups, and behavior under light, it is possible that grit 1 inclusions may be Fe-ore or Ti-ore. These suggestions are only based on hypothesis hence a need for petrographic analysis to determine the specific rock or mineral type. Grit 2 was identified as fine-grained greenish medium sized inclusion with angular to sub-angular shape. This inclusion appears silky and sometimes greasy under light. These inclusions could probably be olivine or rocks containing serpentine. Grit 3 appears as a sub-angular to rounded, white-colored and sometimes colorless inclusions, it produces a vitreous luster under light. Calcite could also account for the features mentioned above and considering that most of the pastes were calcareous, as observed from the petrographic investigation, it is possible that grit 3 may be calcite. Grit 4 was identified in the paste as a pale to dark colored medium to coarse-sized inclusions. It does not show any luster under light. Grit 5 was identified in the paste as sub-rounded, fine to medium-sized inclusions with a lighter color than the matrix, mostly brown. These inclusions could probably be clay pellets naturally occurring in the clay or clay pellets which were dried in the potter's hands and thereafter were incorporated into the paste forming isolated clay granules (Albero, 2014). Finally, Grit 6 is used to describe all other fine inclusions that are visible within the pastes, but could not be identified as a specific rock or mineral.

The primary causes of pottery color are the composition of the clay, the atmosphere, temperature, and duration of firing. The color of a vessel is primarily obtained by impurities occurring in the natural clay material – iron compounds and carbonaceous materials, which take effect during firing (Shepard, 1956:103; Orton &Hughes, 2013:72). The iron compounds are converted to oxides during firing and become permanent colors of the pottery. Shepard (1956) asserts that the amount, particle size, and distribution of iron oxides, together with the characteristics of the clay are determinants of the clay being white, buff, or red when it is fired to a full condition of oxidation. On the one hand, when there is insufficient oxidation, the carbonaceous materials in the clay determine the outcome of the pottery color as black, gray or dark gray. Variations in colors can also be associated to surface treatments, especially those such as slipping and engobe, which modify the original surfaces. Some of the surface treatments that end up modifying the original color of the vessel are unintentional acts by the potter (Rice 1987:138). Most times, the potter rubs his or her wet hands on the surface while throwing the vessel, leaving a thin slurry layer of clay on the surface. During firing, the clay particles compact and align to create a very thin layer which is slightly different in color and well smoothed from what is observed in the fracture. This process is termed as self-slipping. A number of the examined shards from Arslantepe Period VIA show self-slipping on the external surface (Fig. 5a-c).

The core is observed from the cross section of a fresh fracture. Where a core effect is available, the section shows distinct color from the surface and the margins or an interior band of brown, gray to black sandwiched between two lighter layers of paste. Core effects are due to the incomplete removal of carbon by oxidation or deposition of carbon from a reducing atmosphere (Rye 1981:114). Vessels which contain up to 20% organic materials fired in an oxidizing atmosphere exhibit sharp core margins, which are gray or black in color (Rye 1981; Rice 2007: 334). Vessels fired under fully oxidizing conditions and made from materials containing no organic matter will have a uniform margin. Ceramic vessels with the core effect of reddish colors and diffused margins are most likely fired in a reducing atmosphere, but containing no organic materials. The exteriors of these vessel types are mostly black or very dark and the core is most often a "reverse core"; one in which the core is lighter than the surface or subsurface (Rice 2007: 334-335). These cores are present in vessels with fine grained clays, so that the carbon deposit accumulated in the reduced atmosphere does not extend to the core of the vessel wall. This may not occur in coarse grained clays, in which case a core effect is not observed. Vessels fired in reducing atmospheres but with organic materials present in the clay will have a gray or black core in the cross section and will generally have diffused margins. A core effect can also occur as a result of the cooling process. The atmospheric condition can be different during cooling and the rate of cooling can contribute to the removal or deposition of oxygen (Rye 1981: 118). If a vessel is removed from the firing area and allowed to cool in an open air, the atmosphere becomes oxidized. This has no effect if the atmosphere during firing was already oxidizing, but if the atmosphere had been reduced, the core will appear "reversed" in color and display sharp margins.

Four different firing conditions were observed in the shards analyzed and their fracture. These include, oxidizing, reducing, internal oxidizing and external reducing, internal reducing and external oxidizing. These firing conditions were further classified into six different color types; sometimes characterized by different hues, based on the internal, external and the fracture of the shards (Tab.4). These color descriptions are recorded using the Munsell color chart to maintain accuracy (Munsell, 1971).

Four main production techniques used in the manufacture of Arslantepe ceramics were identified. They include wheel-made, hand-made (lack of wheel-marks), and a combination of hand and wheel-made. Wheel-made vessels are identified by the wheel-marks represented by thin, horizontal, parallel and equidistant lines on the internal and sometimes, external surfaces of the shard. More often, spiral traces are evident on the bases (Courty, Roux 1995, also see fig. 5d). This technique was used to make most of the light to pale colored vessels from Period VIA and VIB2 (see Tab. 1a, c). Hand-made vessels were identified by the periodic spacing of horizontal breaks and repetitive imperfection suggesting the use of coils or slabs (Henrickson 1995:83-83). The second class of hand-made vessels was identified as smooth shards without wheel-marks. This technique was used to make the red-black and monochrome burnished shards from Period VIB1 and the red-black burnished and kitchen pottery from Period VIA. Some of the vessels were manufactured using a combination of the hand-made and wheel technique. Shards which were manufactured with this technique were identified as having both coils, slabs, or hand smoothed surface and the wheel-marks. This technique is normally used to build large vessels such as cooking pots, bottles or *pithoi* in a multi-stage and multi-technique construction process which involved the combination of distinct vessel components previously wheel-made or coiled on a turntable. These are then joined together and finished on the wheel (Manuelli 2013:76). The use of this technique has been identified among some of the large light-colored shards in Period VIA and VIB2.

Among Period VIA ceramic assemblage, wheel made production comprised the mass-produced bowls, beaked bowls, medium and large ovoid jars (with or without reserved slip), and the small necked jars. The rest of the ceramic production is represented by hand-made kitchen pottery, red-black burnished pottery, and the black burnished pottery. The ceramic assemblage of Period VIB1 presents an exclusive hand-made red-black and monochrome burnished pottery comprising two-handled jars, bowls, small jars, and jarlets. In Period VIB2, the wheel-made ceramics comprised spouted jars, goblets, high-stemmed bowls, reserved-slip jars of different dimensions, and bowls. However, Period VIB2 ceramic assemblage does not only comprise wheel-made productions, but also a substantial group of hand-made ceramics represented by red-black burnished vessels, black burnished pottery, monochrome pottery, and kitchen pottery (Palumbi, 2008:238). These groups of shards were not part of those analyzed in this research.

3.2: Ceramic Groups and Paste Categories

Arslantepe ceramic assemblage has already been described and classified by several archaeologists (eg. Frangipane and Palmieri, 1983; Palmieri, 1981; 1987). The ceramic groups described in this research follow or refer to previously defined pottery classifications (Tab. 1a-c). Within this system of classification, the paste of each of the shards was characterized with the stereomicroscope and re-grouped into paste categories based on similarities and variations observed in the paste inclusions, their features and the paste texture. This classification ensures a relevant step towards identifying the main characteristics of technological and compositional variability in the organization and production of Arslantepe pottery. The determination of paste categories is based on the consistent presence and wide occurrence of similar and varied attributes and characteristics across the ceramic assemblage.

In order to create paste categories for Arslantepe Periods VIA, VIB1, and VIB2 ceramic assemblage, a number of variables were considered based on the technique of analysis (see Tab. 2a, b, c). The nature of inclusions (lithic components, chaff, mixed) and the paste texture (size, proportion, and shape – “fine texture”, “medium texture”, “coarse texture” and “very coarse texture”) were used as the main characteristic for determining raw material and paste preparation modes. The paste categories are identified by alphabet-numerals.

A number of features common to all samples have been highlighted from the paste analysis; the most commonly observed minerals in all the samples were quartz and mica, occurring in varying frequencies. Lithic components of igneous, metamorphic and sedimentary rocks were also observed. Vegetal materials (chaff) were observed as spiky elongated vughs and were frequent in all red-black burnished shards and less frequent in some of the light-colored vessels. The red-black group of shards also shows high frequencies of lithic and mineral components. The light and pale colored shards show relatively low frequencies of vegetal materials, but varied frequencies of grit 5, mineral, and lithic components.

3.2.1: Period VIA

The ceramic fragments of this Period were identified as part of three main pottery categories: light-colored pottery, handmade red-black burnished and kitchen pottery (Frangipane and Palmieri, 1983:325; also see Tab.1a). The first group consists of those shards probably made by or on a rotating device (or wheel-made). They are generally light brown to buff in color with a range of variations from yellowish to pinkish (Fig. 5c, 7k, 6a-c, e-f, 9b). The second group includes the handmade red-black burnished shards. The red-black burnished shards were oxidized internally and reduced externally or vice versa (Fig.6d). The third group comprises the handmade kitchen pottery (Fig. 7h-j). They are generally brown and self-slipped on the external surface. Only 4 shards of this type were identified among the whole ceramic assemblage analyzed.

The ceramic groups mentioned above were further divided into sub-groups based on their paste characteristics. The sub-groups, defined as paste categories are identified through alphabets assigned to features associated to shards that share similar paste characteristics. Each of the shard was analyzed to identify similarities and differences in the nature of inclusions and the texture of the paste. A total of seventy-six shards were analyzed and the following paragraphs present the paste classes created based on the results collected.

Paste A: This paste is characterized by a mineral fabric with fine to medium fine texture. The paste was well-sorted with a homogeneous to fluidal matrix. Only few shards show granular matrix due to frequent micro-cavities (Fig. 7a-b). Abundant micro-cavities coupled with gray core effects suggest a bad control of firing conditions. Thirty-six percent (36%) of the shards presented a light to dark gray core (Fig. 7b-c), while 4% of the shards had a brownish-buff core (Fig. 7d). The paste colors were dominated by light shades such as buff (86%). Dark shades such as brown, black and red were quite rare (14%).

The fracture surfaces show round-elongate to sub-rounded inclusions. The spatial distributions of grains were quite uniform with sizes ranging between 0.5-2mm. Two shards (4%) show a clustering of inclusions with preferred alignment towards the center of the fracture (Fig. 7c, e). Quartz, mica, and schist were defined with certainty within the pastes. The generic term, grit is designated to inclusions that could not be determined with certainty. Among the rock-forming minerals, quartz was the most frequent inclusion (30%) and mica is moderately frequent (13%, also see Fig. 7c, 7p). Among the rock fragments, metamorphic schist was present in almost all the samples from this group and formed 21.6% of the total paste, prevailing over the other lithic fragments such as grit 3 (13%). Grit 1 was rarely observed and formed only 7% of the inclusions (Fig. 7e). Less frequent was the occurrence of grit 5 and chaff (Fig. 7p). They were sporadically observed in some of the shards and formed

4% and 1.4% of the total paste respectively. Grit 6 was present at a moderately rare frequency (10%, also see Fig. 7f);

The majority of the shards was smoothed on the surfaces (60%) and slipped (20%); other surface treatments such as burnishing (4%) were rarely present. A number of the shards were untreated mostly on the internal surface (16%, Fig. 7g). The typological forms associated with shards from this group include the so-called handmade kitchen vessels (Fig. 7h-j), beaked bowls (Fig. 7k-l), reserved-slip large jars (Fig. 7m-n), and large open bowls (Fig. 7o).

Paste B: Shards comprising this paste class formed only 6.4% of the total ceramic assemblage of Period VIA. They were characterized by a mineral fabric with a coarse texture. The paste, as observed was medium to badly sorted and appears to have a granular matrix due to coarse sized grain distribution. Micro-cavities and vughs were rarely present, suggesting relatively well – controlled firing conditions; only two shards showed gray cores. The matrix was dominated by dark colored shades such as brown (93%), red (4%), black (2%); light shades were rarely present.

Inclusions were generally less present in shards of Paste B. They appear as angular to rounded-elongate bi-modal grains with coarse-sized grains occurring in moderate frequencies (25%). Fine-sized grain inclusions (0.5-1mm) were semi-dispersed in the paste while the coarse grained inclusions (1.1-2.5mm) were mostly clustered in the paste with preferred alignment towards the edges of the fracture (Fig. 8a-b). Mica was present at a very moderate frequency (22%), followed by quartz (16%). All other non-plastic inclusions were predominately rock fragments such as schist (11%), grit 1 (11%) and grit 3 (11%). Grit 2 (6%), grit 4 (6%), and grit 5 (6%) occurred sporadically in the paste.

The surfaces of the shards were mostly treated by smoothing (70%). Slipped (10%), burnished (20%), and untreated (10%) surfaces were present in reasonable quantities. Typological forms associated with shards belonging to this paste category include the jars (See fig. 5a), wheel-made vessels (undetermined; Fig. 8c-d), and the wheel-made mass produced bowls (See fig. 2a).

Paste C: It is characterized by a mixed fabric with a fine to a medium fine texture. Paste C is differentiated from the other pastes based on the high occurrence of chaff. Rock-forming minerals and lithic components were also present, but in lower frequencies.

The paste was generally clayey and well-sorted with grain sizes measuring from 0.5mm to a maximum of 1.2mm and comprised of schist, grit 5 and grit 6. The clay matrix consistency was usually hard with a homogeneous to fluidal structure; matrix color was mostly associated with dark shade ranging from brown to red (70%), gray to black (25%), a few monochrome (3%), and buff tones (2%). Porosity was very low and typified by limited and diffused micro-cavities coupled with a single shard showing a light brown core. Inclusions appear as sub-rounded to rounded-elongate grains, homogeneously dispersed in the paste. Lithic components form only 7% of the total paste. Chaff was very frequent in the paste (30%), and were observed as elongate spiky vughs and straw-like features impressed in the paste.

The surfaces of the shards were mostly burnished (41%) and smoothed (41%). Burnishing was observed in the so-called Red-Black Burnished vessels. Traces were oblique striations and in some cases, discontinuous curvilinear traces; suggesting irregular burnishing. Untreated (16%) and decorated surfaces (2%; fig. 9b) were occasionally observed on some of the shards. The typological forms identified with shards from this group include jars (Fig. 9c) and the red-black burnished bowls (fig. 6d, 9d).

Paste D: Shards from this class were identified as mixed fabric with coarse texture. The matrix color comprised mostly of dark shades such as brown, red, and black. The pastes were coarse and badly sorted causing the matrix to appear granular and easily breaks into flakes (Fig. 10a-b). Porosity was very high and the shapes of the pores were usually macro and micro-vughs. Chaff was highly represented in the paste (40%); lithic inclusions were coarse in size (2-4mm) and were moderately rare in the paste (10%), they were predominantly quartz and fragments of metamorphic rocks (schists).

The surfaces of all the shards were irregularly burnished. The typological forms identified among shards from this group include the red-black burnished jar (Fig. 10c).

Paste E: This category is characterized as a mineral gritty fabric with a fine texture. They appear in very small quantities (only 4 shards were identified). Inclusions were rarely present (10%) and where present, they were very fine (0.5mm, also see fig. 11a-c). The paste colors range from light brown to pale buff and a careful smoothing and reserve slipping was observed on the external surface. Typological forms identified for shards from this class were the large necked jar (Fig. 10d) and the reserved slip jars (Fig. 10e).

Table 2a: Paste Classes for Period VIA Ceramics

Paste Category	**Shards**	**Inclusion Types**
Paste A: Mineral Fabric with Fine to Medium Texture	141, 142, 143, 148, 150, 151, 153, 154, 156, 158, 161, 162, 164, 165, 166, 167, 168, 169, 176, 178, 181, 182, 183, 184, 189, 190,191, 192, 193,198, 200, 201, 213, 214, 215, 217, 218, 233, 234, 236, 238, 240, 243, 244, 253, 257, 341, 344	Quartz, mica, schist, grit 1, grit 3, grit 5, grit 6
Paste B: Mineral Fabric with Coarse to Very Coarse Texture	175, 179, 185, 186, 248	Mica, quartz, schist, grit 5, grit 6

Paste C: Mixed Fabric with and Fine to Medium Texture	149, 152, 155, 157, 159, 160, 187, 199, 229, 232, 235, 239, 250	Chaff, quartz, schist
Paste D: Mixed Fabric with Coarse to very Coarse Texture	230, 231, 249, 254, 255, 256	Chaff, quartz, schist
Paste E: Mineral Gritty Fabric with Fine to Medium Texture	194,196, 197, 340	Grit 6

3.2.2: Period VIB1

The ceramic fragments of this Period were exclusively hand-made red-black and monochrome burnished shards. Following the classification in Frangipane and Palmieri, 1983, three groups of shards were described in this Period. The first ceramic group comprised of fine black burnished shards. They were generally black and burnished on both the external and internal surfaces, but sometimes appear as dark gray. It was mainly a gritty production with finer inclusions and a very regular burnishing pattern. Only one sample was present in the ceramic assemblage examined in this research. The second ceramic group consisted of the red-black burnished shards. This group was sub-divided into three, namely the red-black burnished shards with fine, semi-fine, and coarse pastes. The pastes were generally a mixture of lithic and vegetable components with fine to coarse inclusions depending on the thickness of the vessel wall. The colors ranged from red tones to light brown to black and sometimes dark gray; the third ceramic group was characterized by monochrome shards. They are termed monochrome because of the presence of varying tones of a color on the surface of a single shard; a shard may exhibit varying tones of brown or gray colors on either the external or internal surface. This term can be ascribed to the firing environment where some portions of the vessel receive adequate firing temperature while other portions do not meet the range of adequate firing, causing varying tones of the same color on a shard (Fig. 14g). Just like the red-black shard, they also present a mixture of lithic and vegetable inclusions with varied dimensions, surface burnishing is not always regular.

A total of fifty shards was analyzed and characterized into five paste classes and these are identified through an alphanumeric title assigned to each paste category.

Paste A1: This group presents a mineral fabric with fine to medium and quite rarely, medium coarse texture. The matrix is more homogeneous than fluidal, porosity is very low as no micro-cavities, vughs or voids were observed in any of the shards. The pastes were mostly present in dark tones, ranging from black, gray, brown, to black.

Fracture surfaces were characterized by both small (0.5mm) and well-diffused inclusions (Fig. 12a) as well as medium-sized (1.1mm) and clustered inclusions (Fig. 12b-c). Inclusions form 20% of the total paste and appear as sub-rounded to rounded-elongate grains. The inclusions observed in the paste were quartz, mica, and grit 3. Quartz occurred at a relatively high frequency (12%) as compared to mica (4%) and grit 3 (4%) which were rarely present.

The surfaces of the shards present oblique striation trace suggesting some sort of irregular burnishing. The typological forms identified among the shards included the red-black burnished jars (Fig. 12d-f).

Paste B1: This group is characterized by a mineral fabric with a coarse texture. The matrix is generally granular in structure and easily breaks into flakes. Micro-cavities and vughs were absent. The pastes were dominated by dark shades such as black, red, and brown.

The amount of inclusions was generally lower than those observed in Paste A1, accounting for only 15%. Inclusions appear as angular to sub-angular coarse grains, clustered in the paste without any preferred alignment (Fig. 13a, c) and rarely protruding from the shard fracture (Fig. 13b). Their maximal diameter ranged from 1.7mm to 2.5mm. Quartz (7%), mica (3%), grit 3 (2.5%), and schist (2.5%) were recognized.

Surface treatment consisted of only burnishing, while the other treatments were absent. The typological forms linked to this paste class include the red-black burnished small jars (See fig. 3b).

Paste C1: A prevailing use of chaff and a fine to medium texture were the main characteristics of this paste category. The clay matrix was mostly granular but some isolated shards showed a fluidal to homogeneous matrix. Porosity was very low and typified by a limited number of micro-cavities. Paste color was dominated by dark shards such as red, brown (monochrome), gray, and black.

In Paste C1, the amount of inclusions was higher (57%) than Pastes A1 (20%) and B1 (15%). They were fine to medium sized (0.5-2mm), sub-angular to sub-rounded inclusions. The fine inclusions (0.5-1mm) were dense, covering the entire surface area of the fracture (Fig. 14a), medium-sized inclusions (1.1-2mm) and chaff were interspersed within the paste (Fig. 14b-c). Chaff was very frequent in the paste (25%), but grit 3 (15%), quartz (5%), and mica (5%) also occurred quite often. Schist (5%) and grit 6 (2%) were sporadically observed in some of the shards.

Traces of hasty burnishing were recognized in the majority of the shards (81.25%). One shard exhibited incised and dotted decoration on the external surface (Fig. 14d). The other surface treatments recognized were slipping (6.25%) and smoothing (6.25%). Typological forms identified with shards from this group include the red-black burnished bowl with red-slip (Fig. 14e), red-black burnished bowls (Fig. 14f), monochrome bowls (Fig. 14g) and one pot stand (Fig. 14d).

Paste D1: This paste category has a coarse chaff and mineral fabric. The clay matrixes were granular, irregular and jagged due to the abundance and dimension of inclusions (Fig. 15a). Micro-cavities were less present, suggesting low porosity. The paste color was dominated by dark shades such as red, brown, gray, and black.

The inclusions were mainly represented by chaff (36%), quartz (23%), and mica (19%). Coarse grained grit 3 (13%) was also attested. Schist (7%) and grit 6 (2%) occurred in much lower amounts. Grains were angular to sub-angular in shape, with a maximal diameter ranging from 2.5mm to 6mm and were often protruding from the paste (Fig. 15b-d) while forming few clusters in some cases (Fig. 15e-g).

Burnishing remained the most common surface treatment (95%). Only 5% of the shards were smoothed, while any further surface treatments were absent. Typological forms associated with shards from this group were the red-black burnished and monochrome burnished jars (Fig. 15h-i) and red-black burnished bowls (Fig. 15j).

Paste E1: This paste is characterized by a mineral gritty fabric with a fine texture and only include 4 shards. Inclusions are small (0.5mm), rare or totally absent and where they are present, they are mainly grit 6 (Fig. 16a-b). The paste color shows a monochrome red and black tones. Micro-cavities were absent. One shard showed burnt pastes probably as a result of burnt fine chaff inclusions (Fig. 16c).

The fragments were mainly burnished and typological forms identified for shards from this category were the red-black burnished bowls (Fig. 16d).

Table 2b: Paste Classes for Period VIB1 Ceramics

Paste Category	**Shards**	**Inclusion Types**
Paste A1: Mineral Fabric with Fine to Medium Texture	180, 238, 278, 279, 297, 302, 304	Quartz, mica, grit 3
Paste B1: Mineral Fabric with Coarse to Very Coarse Texture	236, 259, 290, 291, 293	Quartz, mica, schist, grit 3
Paste C1: Mixed Fabric with and Fine to Medium Texture	261, 265,266, 267, 271, 272, 273, 280, 283, 284, 285, 294, 295, 300, 301, 307	Chaff, mica, quartz, schist, grit 3, grit 6
Paste D1: Mixed Fabric with Coarse to very Coarse Texture	258, 260, 262, 263, 264, 268, 269, 270, 276, 277, 281, 289, 292, 296, 298, 299, 303, 306	Chaff, mica, quartz, schist, grit 3, grit 6
Paste E1: Mineral Gritty Fabric with Fine to Medium Texture	274, 275, 287, 305	Fine chaff, grit 6

3.2.3: Period VIB2

The ceramic assemblage investigated in this thesis from this Period is relatively small in quantity (32 shards) as compared to Period VIA (76) and Period VIB1 (50). They are characterized by Uruk-influenced light, buff, and pale colored pottery with an extended variety of shapes and sizes, more or less comparable to shards from Period VIA. One main ceramic group was determined in this Period and was sub-divided into fine, semi-fine and coarse sub-groups of shards (Frangipane and Palmieri, 1983). The shards were generally light, pale to buff and sometimes brownish-orange in color. Some of the shards were identified by a careful smoothing of both internal and external surfaces coupled with either pale gray or white reserved-slips, red-slips or just smoothing on the external surface (Fig. 17a-b, 17g). Another group of shards within this main group is represented by a very fine production with observable equidistant, horizontal, thin lines indicating that the vessels were probably made on a rotating device. They are buff in color and well-fired and sometimes with a sub-set of the wheel-made group comprising of red-slip shards. These shards have a very fine paste and inclusions are rare (Fig. 17d-f).

The ceramic groups were further classified into three paste categories based on the similarities and variations in the nature of inclusions and characteristic features of the pastes. The pastes from this Period are generally characterized by a fine to medium fine paste texture attested by rare to the sporadic fine to semi-fine grained inclusions.

Paste A2: This group constitutes the majority of fragments from Period VIB2 ceramic assemblage (56.25%) examined in this research. It presents a mineral fabric with a fine to medium fine texture. It was distinguished by the presence of grit 5 (Fig. 18a-c). The paste was characterized by medium sized inclusions (0.5-1mm) with rounded equant to elongate shapes. The clay matrix was very homogeneous and sometimes fluidal in structure; porosity was low on the average as only a few of the shards present micro-cavities (Fig. 18e). Only 2 shards present core effects (Fig. 18f-g). The paste colors were dominated by light shades such as brownish orange (50%) and buff (28%). Pale gray colors also occurred quite often (22%).

The paste was well-sorted and the inclusions were predominantly mica (22%) and quartz (20%). Fine fragments of grit 5 (16%), grit 1 (11%) and grit 3 (10%) were also moderately present. Less attested are grit 6 (9%), grit 4 (5.5%), schist (5.5%), and grit 2 (2%) (see fig. 18a-g).

Among surface treatments, slipping was the most common form. Reserved slipping (pale gray, white and buff) was very common (61%), but was also present in relatively high frequencies (33%). Red-slipping (6%) was uncommon, while all other surface treatments were absent. Typological forms associated with this paste class include light-colored reserved-slip bowls (Fig. 18h, also see fig. 17b), reserved-slipped large jars (Fig. 18i), red-slipped high-stemmed bowls (See fig. 17h), goblets (See fig. 17e), and wheel-made bowl (Fig. 18j).

Paste B2: This paste class formed only 12.5% of the total ceramic assemblage analyzed in this Period. It was differentiated by the presence of dominant mineral, lithic, and rare vegetal inclusions. The ceramic pastes were mostly fine-textured with well-dispersed fine sand-sized inclusions (0.5mm). The clay matrix was fluidal with limited micro-cavities. Only three shards showed gray core effects, paste colors are mainly orange with some isolated pale gray colors. The inclusions were predominantly quartz (45.5%). Mica (28.5%) was moderately frequent while grit 3 (7%), grit 4 (7%), grit 5 (7%), and chaff (5%) were rare (Fig. 19a-b).

Reserved slipping was also the most attested surface treatment in this group (75%), red-slipping was frequent (25%), while all other surface treatments were absent. The typological forms identified among the shards included the reserved-slipped medium and large jars (fig. 17a, 19c).

Paste C2: This paste category is characterized by a mineral gritty ceramic with a fine texture (Fig. 20a-c). The inclusions were very rare to absent, where present, they were distributed as isolated fine grit 6 grains within the paste, and reached a maximal diameter of 0.5mm (Fig. 20d-c). The paste colors were largely buff (80%), few brownish orange colored pastes were also present (20%). No micro-cavities and core effects were noted. This is an indication of well-controlled firing conditions.

Smoothing remains the most common surface treatment (80%), while reserved-slipping (10%) and red-slipping (10%) were quite uncommon. The typological forms identified among the shards included goblets (fig. 17c), spouted jar with perforated lags (fig. 17f), and the wheel-made bowl (fig. 17d).

Table 2c: Paste Classes for Period VIB2 Ceramics

Paste Category	Shards	Inclusion Types
Paste A2: Mineral Fabric with Fine Texture	309, 310, 311, 313, 314, 315, 316, 318, 319, 320, 326, 327, 329, 334, 335, 336, 337, 338	Quartz, mica, schist, grit 1, grit 2, grit 3, grit 4, grit 5, grit 6
Paste B2: Mineral Fabric + Chaff with and Fine to Medium Texture	308, 312, 317, 339	Quartz, mica, fine chaff, grit 3, grit 4, grit 5
Paste C2: Mineral Gritty Fabric with Fine to Medium Texture	321, 322, 323, 324, 325, 328, 330, 331, 332, 333	Very fine grit 6 inclusions

3.3: Discussion

Analysis of the ceramic fragments included the collection of attributes relevant to questions about the technological choices of Arslantepe prehistoric potters. In this section, comparisons will be made between the ceramic groups described in each of the chronological phases on the one hand, and on the other hand,with the results obtained from the obtained from the petrographic investigations on shards from Arslantepe (Fragnoli and Palmieri, forthcoming), in order to identify the technological choices made by Arslantepe potters during the production process and to determine how these similarities and variations relate to material culture, the geological and local environment, and social identity.

Each of these ceramic assemblages exhibit some characteristics, both in repertoire and paste features similar to and different from the other. Period VIA is more comparable to Period VIB2 than to Period VIB1, in terms of manufacturing characteristics, similarities were affirmed by the presence of wheel-made and reserved-slip productions in both Periods VIA and VIB2. The only common factor identified in Period VIA and VIB1 is the presence of the Red-Black Burnished shards, though in very different amounts.

The diagnostic fragments suggest that the repertoire of Period VIB2 is similar to that of Period VIA with reference to a number of vessel categories, but show substantial variations in typological forms and in quantitative distribution (appendix iii). Similarities in the two Periods lie in the presence of wheel-made and reserved slip productions. Period VIA ceramic group presents a typological class of reserved slip jars (8%), light colored bowls (13.5%), beaked bowls (1%), wheel-made medium to large sized necked jars (11%), and hand-made kitchen pots (2.5%). The typological class of Period VIB2 also present reserved slip jars (9%) alongside reserved slip bowls (1%), wheel-made medium to large sized jars (6%), but with shapes different from those observed in Period VIA. While Period VIA wheel-made jars present an ovoid large shape (fig. 2c), those in Period VIB2 present an oval to elongated shape (fig. 4a-b). The remainder of the wheel-made shards from Period VIB2 comprise goblets (1%), spouted jars with perforated lags (1%), and red-slipped high stemmed bowls (2%; see appendix iii, Tab. 11).

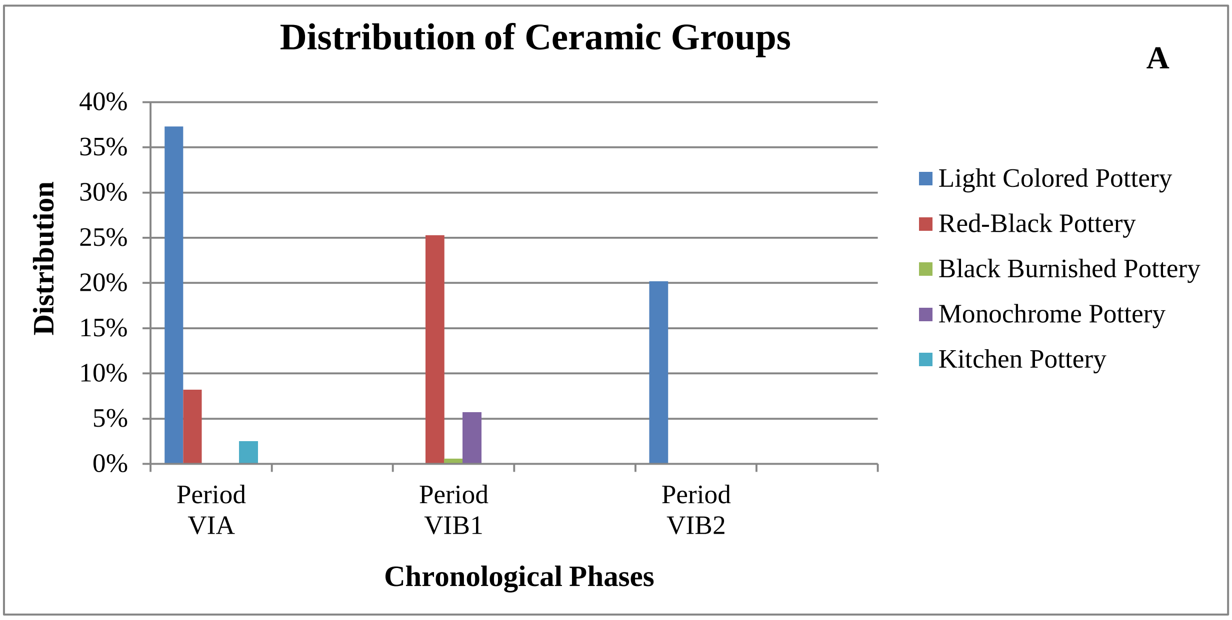
A major technological change, different from the wheel-made productions was also observed in Period VIA. This was represented by the handmade red-black burnished shards.

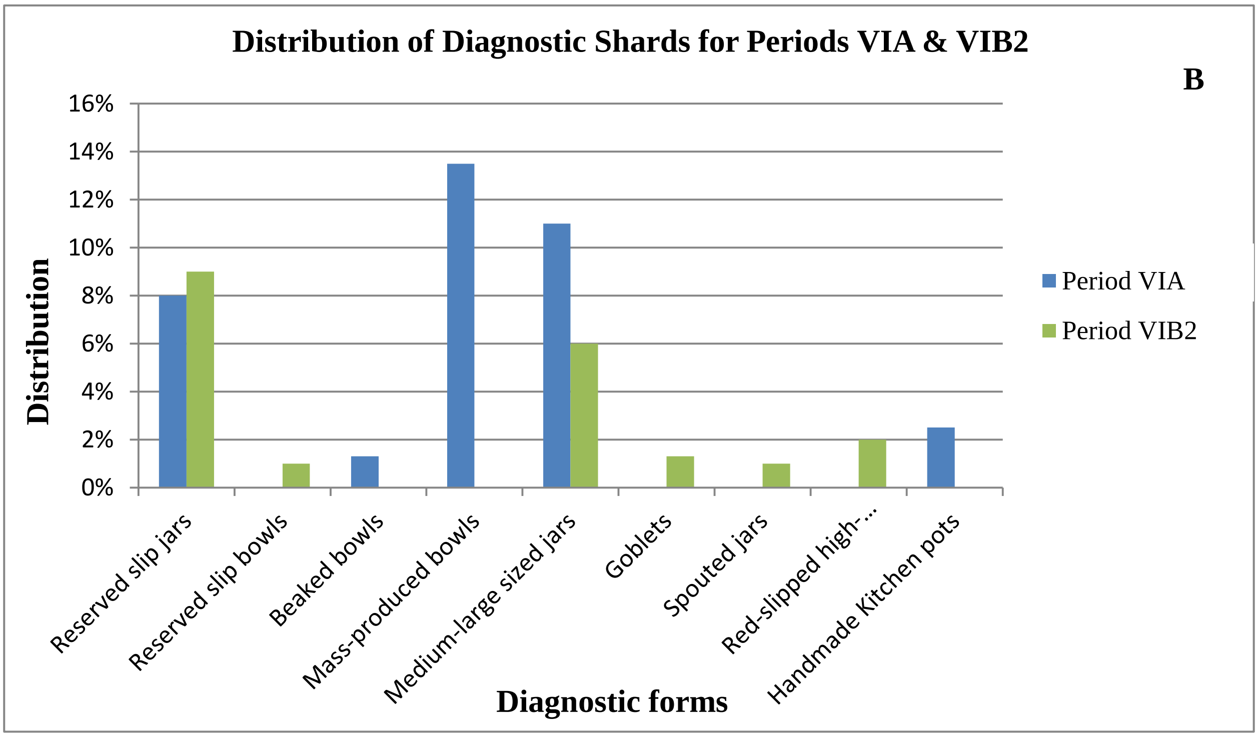
They were characterized by different colors of external and internal surfaces. The firing conditions of shards from this group can be described as oxidized internally and reduced externally or vice versa. With this firing technique, one part of the pot is fired in an oxidizing atmosphere, the other one in reducing conditions. In the alternate bichromatic pattern of the red-black burnished pottery from Arslantepe, the most visible part of the pot is black due to reducing firing atmospheres. Thus, open vessels are black on the interior and red on the exterior, while closed vessels show the opposite pattern (black outside and red inside).

The red-black burnished shards formed only 8% of the total ceramic assemblage analyzed and present a fairly pronounced typological form comprising of bowls (with or without handles), small jars, and globular jarlets. In this regard, it should be mentioned that the red-black burnished shards are similar to those in Period VIB1 in terms of the technology of manufacture; handmade manufacture, firing technique, and surface treatments. The red-black burnished ceramic group of Period VIB1 presents diagnostic fragments of hemispherical bowls with a flat bottom, two-handled jars, and the handleless small jars (see fig. 3a-c). In terms of taste and typological models, Period VIA red-black burnished pottery has more affinities with the Central Anatolian elements, while those from Period VIB1 show closer affinity to the East-AnatolianTranscaucasian culture (see Tab.5).

Period VIA	Period VIB1
Handled Bowls Bowls Small globular jars	Bowls (flat base) Small Jars Two-handled Jars Jarlets

Table 5: Distribution of Red-Black Burnished Typological Forms in Periods VIA & VIB1





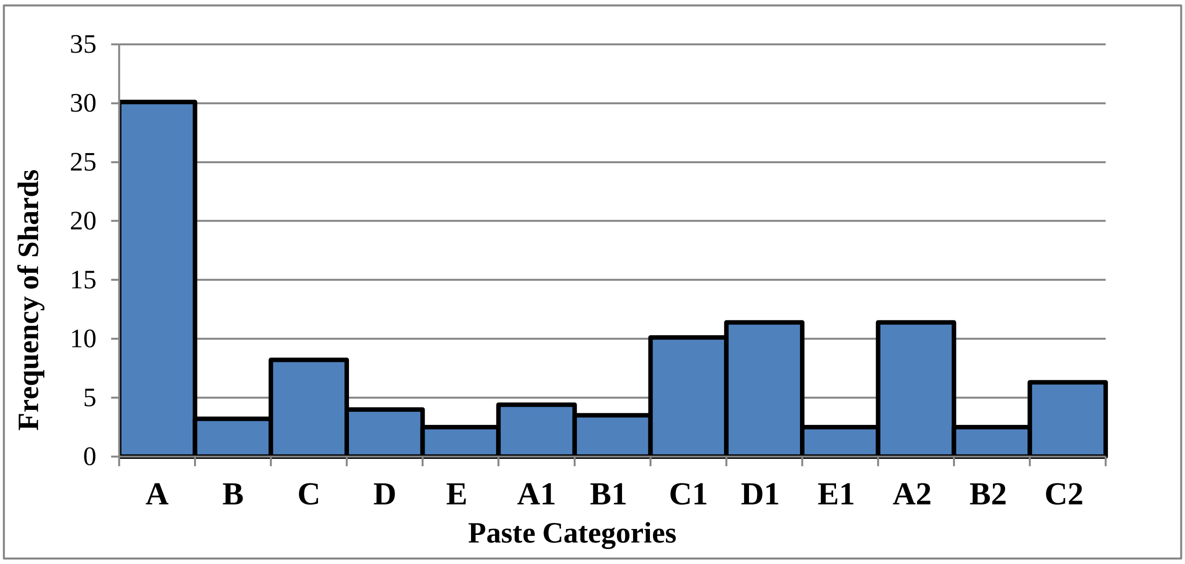
Appendix iii: Quantitative Distribution of ceramic groups in Periods VIA and VIB2

Differences and continuities in the organization of ceramic production; the raw material procurement and paste preparation modes was further realized by comparing the paste categories to the archaeological classes and typological forms (Tab.11). In the following paragraphs, I will present an analysis of the synchronic and diachronic relationships between and among the ceramic paste preparation traditions of the different chronological phases.

The examination of ceramic pastes across the chronological phases indicates the exploitation of lithic, mineral, and organic (chaff) components in paste preparation. A total of thirteen paste categories was described (Appendix iv). Quartz, mica, schist, chaff, and grit (undetermined inclusions) were observed with varying dimensions and frequencies throughout the pastes (Tab. 3 & 10). The presence and selection of certain paste categories for specific vessel typology suggest that the technological choices made by the Arslantepe potters during the manufacturing procedures and organization of the production were on the one hand influenced by the functions of the vessels, geological location and local environment and on the other hand, by socio-economic, political changes, and the intercultural relations between Arslantepe and its environs.

Paste Categories **Period VIA**	Inclusion Size range (mm)	Paste Categories **Period VIB1**	Inclusion Size range (mm)	Paste Categories **Period VIB2**	Inclusion Size range (mm)
Paste A	0.5-2mm	Paste A1	0.5-1.1mm	Paste A2	0.5-1mm
Paste B	0.5-2.5mm	Paste B1	1.7-2.5mm	Paste B2	≤ 0.5-1mm
Paste C	0.5-1.2mm	Paste C1	0.5-2mm	Paste C2	≤ 0.5mm
Paste D	2-4mm	Paste D1	2.5-6mm		
Paste E	≤ 0.5mm	Paste E1	≤ 0.5mm		

Table 10: Distribution of Inclusion sizes



Appendix iv: Quantitative distribution of paste categories for Periods VIA, VIB1, & VIB2

Five paste categories were recognized in Period VIA characterized and identified by the use of mineral, lithic and chaff inclusions (chapter 3.2.1, Tab. 2a). Paste A and B were characterized by the exclusive use of lithic and mineral fragments. The pastes of these two groups were quite similar based on the nature and proportion of inclusions. Quartz, mica, and schists were frequent as well as grits 1, 3, and 5. The paste textures of category A and B varied substantially. Paste A presented a fine and sometimes medium fine texture with well-sorted fine to medium sized inclusions, frequent micro-cavities, gray and brownish gray cores (see fig. 7a-d) while Paste B presented a coarse texture with badly-sorted lithic and mineral inclusions which were clustered in the paste and sometimes with preferred alignment towards the edges of the fracture (fig. 8a-b). Paste A was probably preferred over Paste B in making kitchen vessels, beaked bowls, and the reserved-slip large jars. Paste B was mostly used to make the mass-produced bowls. In terms of quantitative distribution, the majority of the shards from Period VIA were made with Paste A (30.1%, also see Appendix iv). Pastes C and D can be conveniently classified as chaff pastes. They present primarily chaff inclusions with rare lithic and mineral inclusions. The inclusions were mainly medium-sized quartz, mica and some isolated coarse grit 6 inclusions. Paste C presented a fine to medium-fine texture, while

Paste D presented a coarse texture. These two paste categories were recurrent in the red-black burnished bowls and jars (Fig. 9a, 10a-b). Some wheel-made jars were identified with Paste C. Quantitatively, Paste C (8.2%) was probably preferred over Paste D (4%) in the manufacture of these vessels (appendix iv). Paste E presented an extremely fine mineral gritty fabric with a very fine paste texture (Fig. 11a-c). Only 2.5% of shards, comprising 3 medium sized reserved slip jars and one kitchen vessel were observed in this paste category.

All five Paste classes showed some variations, even on a small scale. Most frequently, these variations were observed in manufacturing and technological practices. Within the ceramic manufacturing industry of Period VIA, a technological change occurs – the use of vegetal materials (chaff), lithic and mineral fragments became attested. This production is differentiated from the prevailing wheel-made productions influenced by Syro-Mesopotamian Uruk elements by the display of high compositional variability and typological forms. This change correlates to a type of red-black burnished vessels comprising of bowls with flat base, handled bowls, and small pots, with a completely different type of production and technology influenced by East-Anatolian Transcaucasian element.

Period VIB1 presents a class of shards which was predominantly handmade red-black and monochrome burnished vessels with a wider functional repertoire. Both lithic fragments and chaff inclusions were used in the five paste groups described in this Period. The use of chaff was very frequent (31%) in the pastes, while lithic and mineral fragments occurred in relatively medium frequency and was limited to quartz (27%), mica (16%), schist (7%), grit 3 (17%), and grit 6 (2%; Tab.3). The paste is generally a mixture of lithic, mineral, and vegetable components with added fine and coarse inclusions depending on the thickness of the vessel wall and function of the vessel. For instance, grit 3 was regularly observed in the red-black burnished small jars and jarlets, chaff and grit 6 were recurrent in the red-black burnished bowls, two-handled jars, and monochrome jars. Paste A1 and B1 were characterized by the predominance of lithic fragments (some fine chaff inclusions were also present in small quantities), while Paste C1 and D1 present mainly chaff inclusions with rare schist and grit 6 inclusions, Paste E1 present a very fine mineral gritty and chaff paste, presenting a similar texture to that of Paste E in Period VIA (fig. 16a-b, also see fig. 11a-c). Similar to the trends observed in Period VIA, the texture of the pastes vary. Paste A1 and C1 present a fine to medium-fine texture typified by the presence of well-dispersed small sized inclusions (see fig. 12a, 14b), while Paste B1 and D1 present a coarse texture comprising of coarse inclusions clustered and sometimes semi-dispersed within the pastes (see fig. 13a-c, 15a, e-g).

Although this Period offers a wider functional repertoire, it presents limited information when correlated with the paste groups. Although the quantitative distribution suggests a preference of Paste C1 (10.1%) and D1 (11.4%; see appendix iv), this is not a strict technological practice; any of the typological forms or functional class could be made from any of the five paste categories. For example, some of the red-black burnished bowls and burnished monochrome jars were observed in both Paste C1 and D1 categories. A variation in the paste texture occurs only where there is a change in the dimension of the vessels.

The most prominent characteristics of Period VIB2 is the return of the wheel-made and reserved-slip productions, a phenomenon which was probably interrupted in Period VIB1. Nevertheless, new trends; variation in paste tradition and typological forms distinguishes this period from Period VIA. The shards comprising this Period seemed to have been generally well-fired as compared to those in Period VIA. In fact, only six (6) shards showed light carbon effects and micro-cavities were almost absent. Three Paste classes were described and generally characterized by fine to medium fine paste texture attested by the presence of fine to fine sized inclusions. Grit 4 (11%), grit 5 (10%), and grit 6 (18%) stood out among the inclusions used in the paste. The use of chaff was also attested, but in very small quantities (3%); the other lithic fragments in the paste consisted of quartz, mica, schist, grit 1 (3%), grit 2 (4%), and grit 3 (7%; Tab. 3).

Pastes A2 and B2 were characterized by prevailing lithic, mineral, and grit 5 inclusions (see fig. 18a-f, 19a-b). Chaff inclusions were present in some of the shards, but in fine and modest quantities (see fig. 18g). The lithic inclusions were mostly small, but also medium in size, which gives the shards a dense and granular texture. These paste categories were mostly used to manufacture the reserved-slip jars, kitchen pots (fig. 21), light colored bowls and the red-slip, high-stemmed bowls. It should also be mentioned that Paste A2 seems to be the most preferred paste category considering that a relatively high frequency of the shards are observed with this paste (11.4%, see appendix iv). Paste C2 is characterized by a fine mineral gritty texture with very rare fine sized grit 6 inclusions (see fig. 20a-c, 20d-f). The paste texture is similar to those observed in Pastes E and E1 from the preceding Periods. Paste C2 was probably preferred over the other paste categories to manufacture the fine wheel-made necked jars and bowls, goblets and spouted vessels

Although Paste A2 and B2 seem to have similar paste texture, the specific inclusion types vary. Some of the lithic fragments observed in Paste A2 were absent in Paste B2. Quartz, mica, grit 2, 3, and 5 were observed in both Pastes, however, schist, grit 1, 4, and 6 were only observed in Paste A2. Chaff inclusions were only present in Paste B2. This variation in the inclusion types implies that the inclusions were deliberately added by the potters probably because this type of inclusion was better suited for the intended function of the vessels

3.3.1: Paste Change Over Time

The total paste frequencies throughout the three chronological phases suggest changes in some of the paste preparation traditions. The organization of paste and paste type frequencies changed quite dramatically from Period VIA to Period VIB1 (see Tab. 3; appendix iv). Most notable is the proliferation of the red-black burnished productions which become the most dominant production in Period VIB1. Subtle changes in the pastes of Period VIB2 with reference to the pastes of Period VIA were observed. These changes relate to the paste type and frequency distribution of inclusion types.

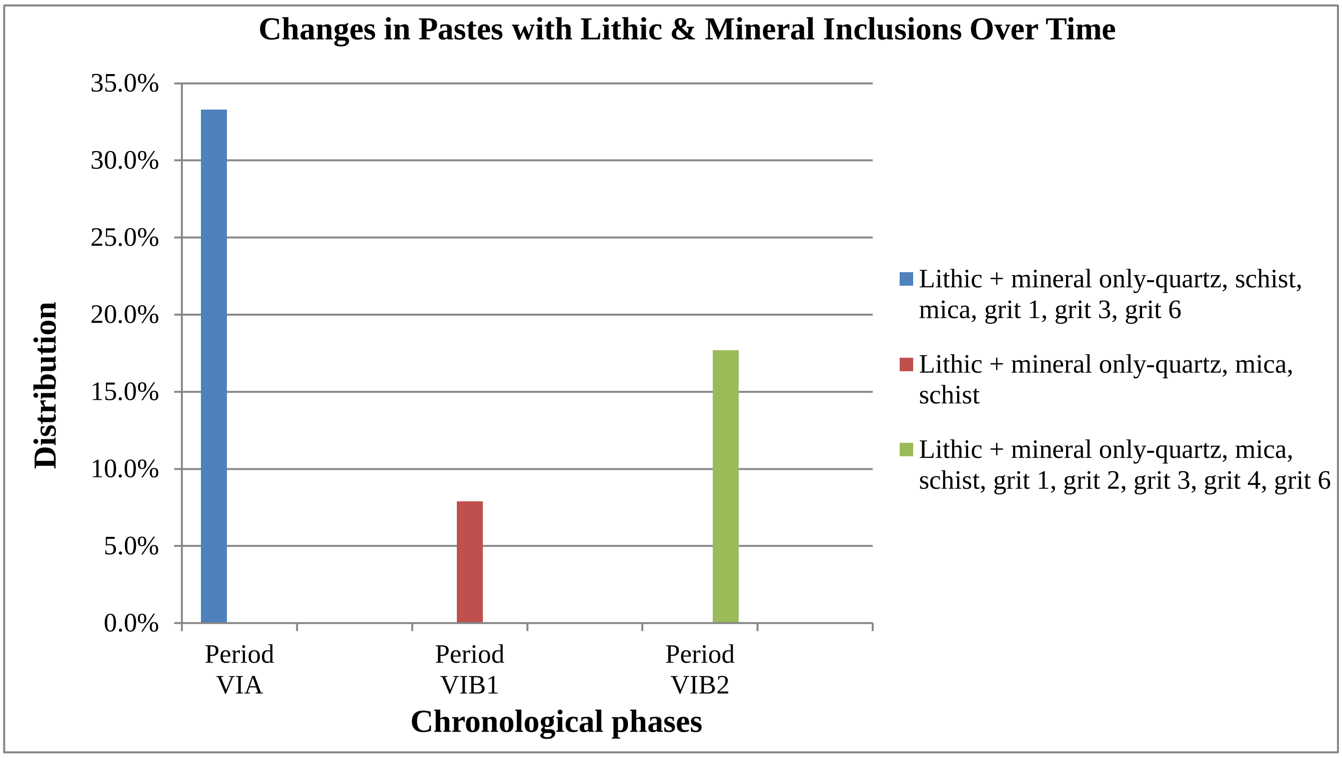
During Period VIA, the majority of the shards was made from pastes with mainly lithic and mineral inclusions (33.3%). The specific lithic and mineral inclusions consist of quartz, mica, schist, grit 1, grit 3, and grit 6. However, this trend begins to change slowly with the accession of vessels with mixed inclusion types (12.2%). Chaff became the main non-plastic inclusion alongside some lithic and mineral inclusions. A conspicuous change in the choice of lithic and mineral components was observed in the pastes with mixed inclusions as compared to those observed in the pastes with exclusive lithic and mineral inclusions. Quartz and schist were the only mineral and lithic component observed in the pastes. The fine gritty pastes in this Period occurred in very small quantities (2.5%) and consisted of only grit 6 inclusions (see Tab. 2a; appendix v).

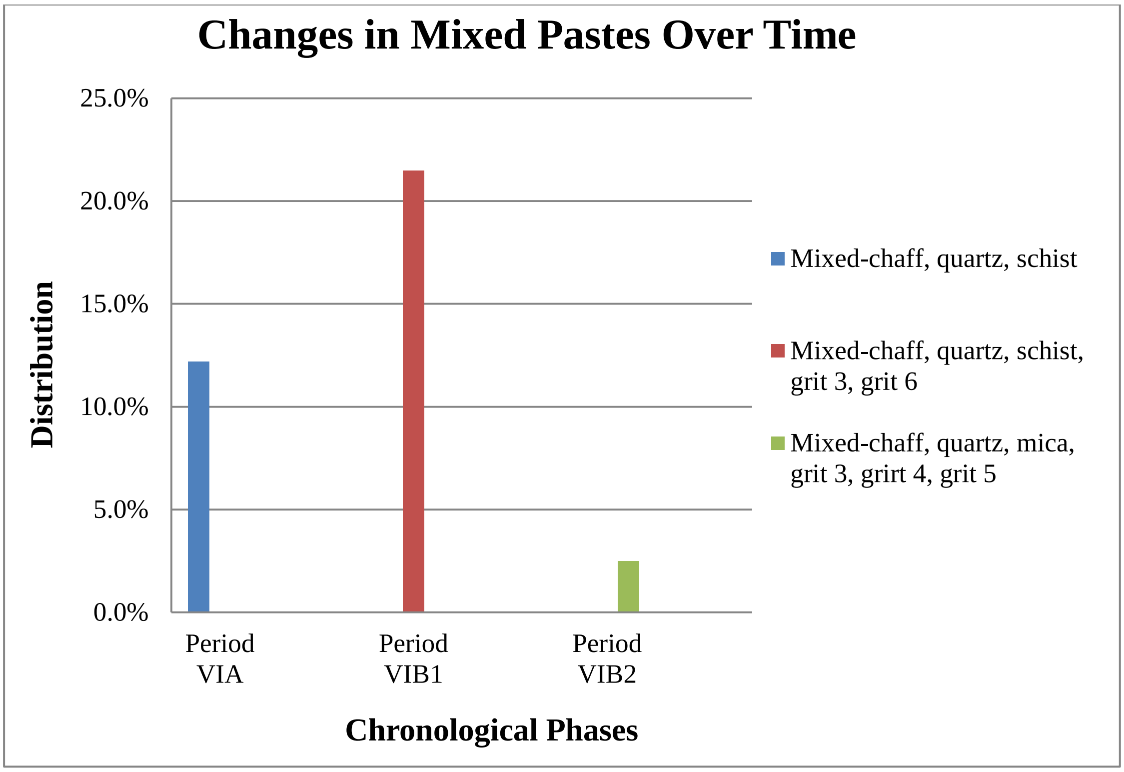
The paste tradition was totally different during Period VIB1. Now, the majority of vessels was made from pastes with mixed inclusions (21.5%) as compared to those vessels made from pastes with exclusive lithic and mineral components (7.9%). Chaff was the main non-plastic inclusion in the mixed pastes alongside some isolated occurrence of quartz, mica, schist, grit 3, and grit 6. The selection of raw materials for the mixed pastes is very different from what was observed in Period VIA. Mica, grit 3, and grit 6 were introduced into the pastes and as already discussed in chapter 3.3, coarse pastes with mixed inclusions became the most preferred paste type (see appendix v). For the pastes with exclusive lithic and mineral inclusions, the specific inclusion type was slightly reduced in comparison with Period VIA (quartz, mica, schist, grit 1, grit 3, and grit 6). The inclusions were now only quartz, mica, schist, and grit 3. As observed in Period VIA, the quantitative distribution of the fine gritty pastes was very low (2.5%). However, alongside the exclusive use of grit 6 in the fine gritty pastes (also observed in Period VIA), fine chaff inclusions were added to the pastes (see Tab. 2b).

Period VIB2 had a different paste texture outline. Although the specific inclusion types were mostly similar to those in Period VIA, the paste texture was generally fine to semi-fine and the amount of chaff inclusions and some of the lithic and mineral inclusions were reduced (see Tab. 2c). The majority of the shards was made from pastes with exclusive lithic and mineral inclusions (17.7%). Mixed inclusion pastes occurred in very small quantities (2.5%). In contrast to the pastes with mixed inclusions in Period VIA and VIB1, the lithic and mineral inclusions observed in the pastes with mixed inclusions were very varied. Grit 4 and 5 were added to the paste, but no schist was observed (Appendix v).

The pastes of the red-black burnished shards from Periods VIA and VIB1 vary quite substantially. The pastes of the red-black burnished shards from Period VIA presents a mixed fabric with a fine to a medium fine texture (Paste C; 0.5-1.2mm) and a mixed fabric with coarse texture (Paste D; 2-4mm). The specific inclusion elements were observed as chaff, quartz, and schist and these paste types were used to make the red-black burnished jars and bowls. In contrast to Period VIA, the red-black burnished shards analyzed in Period VIB1 were observed throughout all the paste categories. This is to say that all the paste types identified were used to make any of the red-black burnished vessels. Differences also lie in the specific inclusion elements and sizes. For the mixed fabrics of this Period, the pastes have a medium texture with inclusion sizes ranging between 0.5-2mm (Paste C1) and also a coarse texture with inclusion sizes ranging between 2.5-6mm (Paste D1). The inclusion types were quite varied as compared to what was observed in Pastes C and D (Period VIA). They included Chaff, mica, quartz, schist, grit 3, and grit 6.

There is a very clear analogy between the different paste types observed in the analysis and the ceramic groups. Comparison between the pastes of Periods VIA, VIB1, and VIB2 and ceramic groups suggest some production relationships in the three formal types, though Periods VIA and VIB2 have the strongest links.

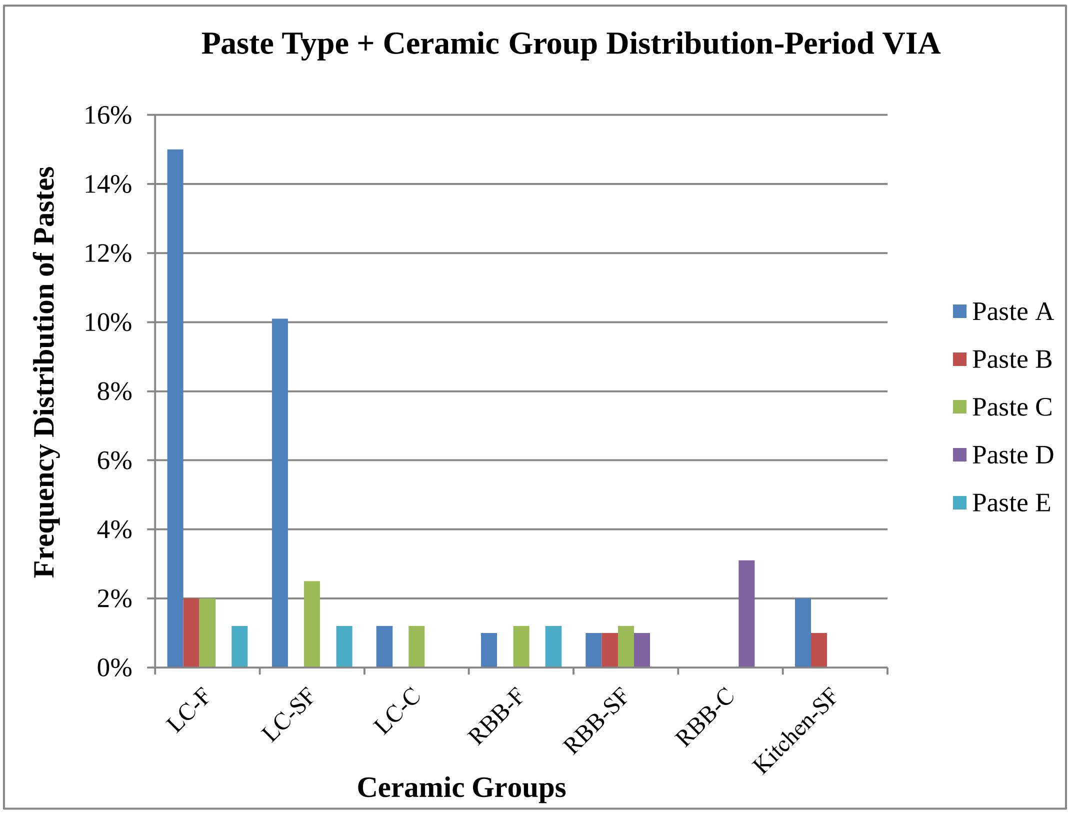




Appendix v: Changes in Paste Inclusions over Time

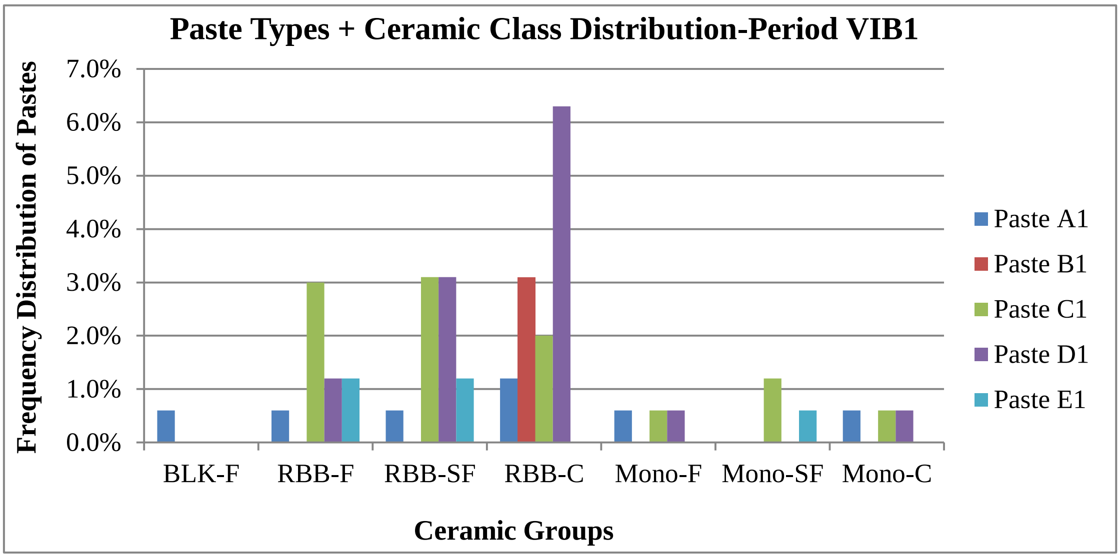
Six different ceramic groups were described in the three chronological phases analyzed in this research. The classification and descriptions of the ceramic groups follow classifications and descriptions previously defined by several archaeologists (eg. Frangipane and Palmieri, 1983). Period VIA light-colored, fine and semi-fine ceramic groups (Tab. 1a, 11) present a rather strict paste recipe in the manufacturing of most of the vessels as compared to light-colored coarse, handmade red-black burnished and handmade kitchen ceramic groups. About 15% of the shards classified under the light-colored fine ceramic group were observed with paste type A. A few of the shards were observed with paste types B (2%), C (2%), and E (1.2%). Among the semi-fine light-colored shards, 16% of them were observed with paste type A, while 2.5% and 1.2% were observed with paste type C and E respectively. These dynamics observed and the recurrence of paste type A probably suggests that specific pastes were related to very specific technological recipes. The paste traditions also suggest that the ceramic types produced during this Period changed, but the pastes remained substantially homogeneous. Similarly, the handmade coarse red-black burnished ceramic also presents shards with only Paste type D (3.1%), however the limited number of shards and lack of recurrence does not allow for any definite conclusions. On the contrary, the remaining ceramic groups do not present a strict paste type choice for vessel manufacture (see Appendix vi).

The relationships between paste types and the different ceramic groups are not strongly linked in Period VIB1 as was observed in Period VIA. Paste types and ceramic groups do not exactly match even though there appears to be a preference for specific paste types in the case of specific typological forms. For example, about 6.3% of the shards belonging to the handmade coarse red-black burnished ceramic group were observed with paste type D1 and were usually red-black burnished pots. The handmade fine red-black burnished ceramic class presents shards made with type A1 (0.6%), C1 (3%), D1 (1.2%), and E1 (1.2%) pastes. It seems probable that different paste types were used for the same pottery class in the rest of the ceramic class (see Appendix vii).



Appendix vi: Paste Distribution among Period VIA Ceramic Groups.

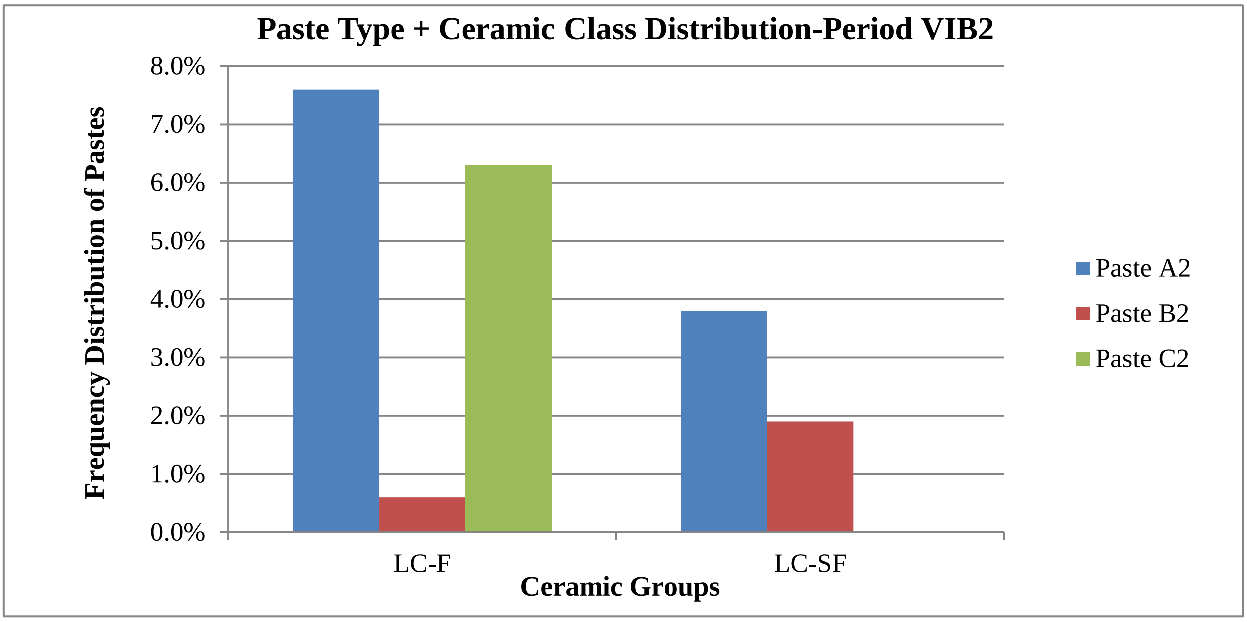
LC-F: Light-colored fine pottery; LC-SF: Light-colored semi-fine pottery; LC-C: Light-colored coarse pottery; RBB-F: Red-black burnished fine pottery; RBB-SF: Red-black burnished semi-fine pottery; RBB-C: Red-black burnished coarse pottery; Kitchen-SF: Semi-fine Kitchen pottery.



BLK-F: Black fine pottery; RBB-F: Red-black burnished fine pottery; RBB-SF: Red-black burnished semi-fine pottery; RBB-C: Red-black burnished coarse pottery; Mono-F: Monochrome fine pottery; Mono-SF: Monochrome semi-fine pottery; Mono-C: Monochrome coarse pottery.

Appendix vii: Paste Distribution among Period VIB1 Ceramic Groups.

During Period VIB2, the apparent relationship between the technological tradition of using specific paste types for specific pottery class or typological forms seemed straightforward (Appendix viii). The pastes of the shards belonging to the light-colored fine ceramic group were mainly made from paste type A2 (7.6%) and C2 (6.3%). Less than 1% of the shards were observed with paste type B2. This group mainly comprises of goblets, spouted jars, light-colored bowls, plain wheel-made small to large jars, reserved slip jars and bowls. Paste type A2 was very recurrent in the very fine wheel-made productions such as goblets, spouted jars, light-colored bowls, and in some cases, reserved slip jars. Paste type C2 was common in the wheel-made jars, reserved slip jars and bowls, and the red-slip high stemmed bowls. The light-colored semi-fine shards were observed with paste types A2 (3.8%) and B2 (1.9%). Quantitatively, only 9 shards were observed and they did not present any strict correlative pattern between paste types and pottery classes as most of the typological forms were present. For example, some reserved slip jars were observed with paste A2 and B2. The lack of correlation may be as a result of the small quantity of shards that were analyzed in this thesis therefore not allowing for an objective comparison.



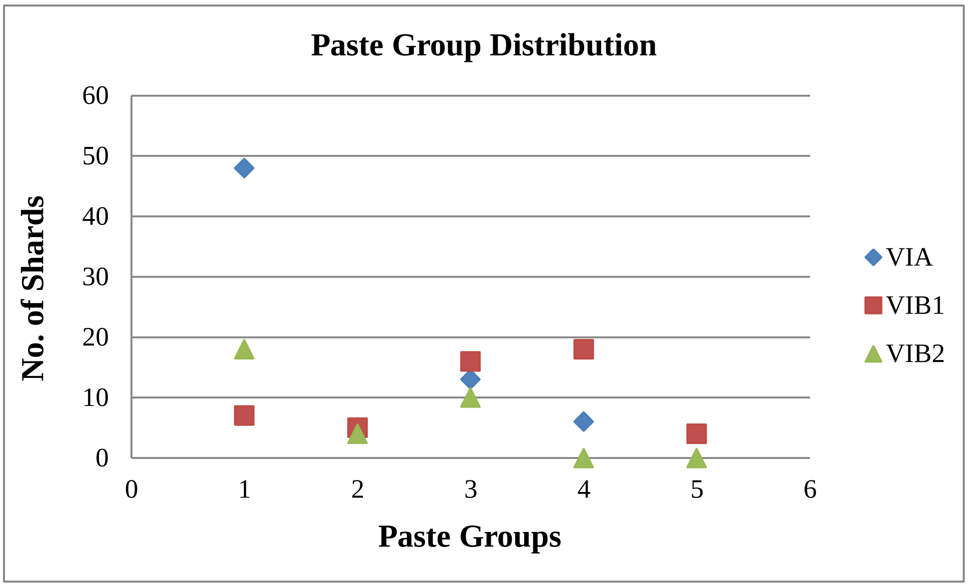
Appendix viii: Paste Distribution among Period VIB2 Ceramic Groups.

3.3.2: Continuity or Coincidence?

The substantial differences in ceramic production of the three chronological phases have been outlined, but the question of continuity still remains. Considerable continuity in vessel forms and shapes, surface and paste colors, paste types and constituents, and firing techniques were observed in the different phases of the Arslantepe ceramic assemblage, even on a small scale.

Continuity in paste constituents has been determined by the presence of similar inclusion types in Periods VIA and VIB2. The paste constituents of Period VIB1 also share some limited similarities by the presence of metamorphic rock fragments. However, the specific lithic components were the same as those observed in Period VIA and VIB2. Quartz, mica, and schist remain the most common inclusions in all the chronological phases. The preference of fine to medium fine paste texture was evidenced throughout the chronological phases by the relatively high frequencies of such paste types. Similarly, the less preference for gritty pastes with very fine texture continues to occur throughout the Periods (See Tab. 8).

The paste type tradition seems to follow a similar trend in Period VIA and VIB1. The paste types are mainly fine to coarse with a limited number of very fine gritty pastes. Pastes A from Period VIA is similar in texture and fineness to Paste A1 from Period VIB1. These paste types present exclusively lithic and mineral inclusions with a fine to medium fine texture (see appendix v). A similar trend was also observed in Paste A2 from Period VIB2, which presents a generally fine paste with exclusive lithic and mineral inclusions. These three paste categories have been broadly classified as Paste group 1. Paste B and B1 are the generally similar in terms of coarseness of the paste and inclusion types. They present coarse pastes with lithic and mineral inclusions. Paste B and B1 have been broadly classified as Paste group 2. On the contrary, coarse pastes were not observed in Period VIB2 (see Tab. 2c). Pastes C and C1 are generally similar in fineness, while Paste D and D1 are similar in coarseness. Pastes C and C1 have been broadly classified as Paste group 3 and Pastes D and D1; Paste group 4. Both paste groups present a prevalence of chaff alongside lithic and mineral inclusions. Paste B2 from Period VIB2 is more similar to Paste group 3. Paste type E and E1 present very fine gritty pastes and are generally similar in fineness to Paste C2. They have been grouped as Paste group 5. It should be reiterated that the similarities mentioned here are based on the fineness and coarseness of the pastes as well as the distribution of similar inclusion elements (see Tab. 12, appendix ix).



Appendix ix: Quantitative Distribution of Paste Groups

As in the case of the paste tradition, interesting observations were made when the ceramic group of Period VIA was compared to those of Period VIB1 and VIB2. At a first glance, there appeared to be major divisions between the three Periods since, in Period VIB1, there was a radical change in the technology of ceramic manufacture. Jars, bowls, and pots were present throughout the ceramic assemblage, however, variations were observed within the individual classes, shapes, and sizes. The ceramic repertoire of Period VIA shares some similarities with those of Period VIB2; for example, the reserved-slip necked jars of Period VIA were similar to those observed in Period VIB2 (fig. 2a, 4a-b, 6c, f, 17a-b). The ceramic repertoire dramatically changes in Period VIB1, characterized by a single class of hand-made red-black burnished two-handled jars, small jars, bowls, monochrome burnished jars, and cups. Typological forms such as the high-stemmed bowls in Period VIA continues to be utilized in Period VIB2, but their profiles are largely varied. For this investigation, the high-stemmed bowls were not identified among the shards from Period VIA (see Frangipane and Palmieri, 1983:334-336, 356-358, 551 for description; also see fig. 4g, 22). Spouted Jars and goblets are fairly common in Period VIB2, but totally absent in Periods VIA and VIB1. The large representation of bowls and jar forms in Periods VIA suggests the centralization and redistribution of essential goods such as food and labor.

Observation of vessel forming and surface treatment techniques do not indicate significant differences between Period VIA and VIB2 but are greatly varied in Period VIB1. The use of the wheel or a rotating device was attested in Periods VIA and VIB2 by the presence of relatively large quantities of shards (see Tab. 1a & c). The wheel was very frequently used to shape mass-produced bowls, and probably finish the necks of cooking pots and jars (Frangipane, 1993).

Surface treatments across the Periods were generally burnishing, smoothing, reserved slipping, self-slipping, and red-slipping. Decorated shards were rarely present – only two shards from Periods VIA and VIB1 showed incised and dotted decoration on the external surfaces (Fig. 9b, 14d). In Period VIA, a few of the shards were untreated, mostly on the interior surface (Fig. 7g). In this same Period, some shards present different finishing treatments for each surface. Burnishing was observed in Period VIA (18.4%) and Period VIB1 (78%) only. Reserved slipping occurred only in Period VIA (9%) and VIB2 (47%), as well as smoothing (22.4% and 44%, respectively). Self-slipping was only observed in Period VIA (25%). Red-slipped shards were only recorded in Periods VIB1 (20%) and VIB2 (9%). A combination of surface treatments on either surface of the same shard was observed only in Period VIA. Some of the shards were observed with smooth + untreated (4%), reserved slip + untreated (5.2%), and burnish + smooth (16%) surfaces (Tab. 6). However, it should be noted that these effects may have been as a result of conservation conditions causing a part of the shard to wear off.

In sum, it is fairly possible to say that continuity in the tradition of pottery manufacture is observed to an extent in Period VIA and VIB2. This is indicated by numerous typological and technological elements such as some similar repertoire of forms and the lasting use of reserved-slip as well as similar raw material procurement patterns. It also seems that the rarity of the very fine gritty pastes throughout the Periods could be attributed to a preference for fine to coarse vessels.

3.3.3: Macroscopy Versus Petrography: A Comparison of Results

Macroscopic analysis of the pastes of 158 ceramic shards from Arslantepe enabled the distinction of thirteen (13) main paste categories (discussed in chapter 3.2). The observations made about the characteristics and composition of the pastes are mostly compatible with the results obtained from the petrographic investigations on 4^{th}-2^{nd} millennium BCE ceramics from Arslantepe to determine technological continuity, innovation, and change (Fragnoli and Palmieri, forthcoming). The petrographic results obtained were divided according to Ca-rich versus Ca-low fabrics, the presence or absence of vegetal temper, and the type of mineral or rock inclusions – volcanic, plutonic or metamorphic origin. The observations made from the macroscopic and petrographic investigations suggest three things; 1) In Period VIA and VIB2, igneous and metamorphic rocks were exploited, 2) Sedimentary rocks – limestone occurred in small and negligible quantities, 3) The use of chaff occur in moderately rare amounts in Periods VIA and VIB2, but very frequent in Period VIB1, and 4) The red-black burnished production is substantially different.

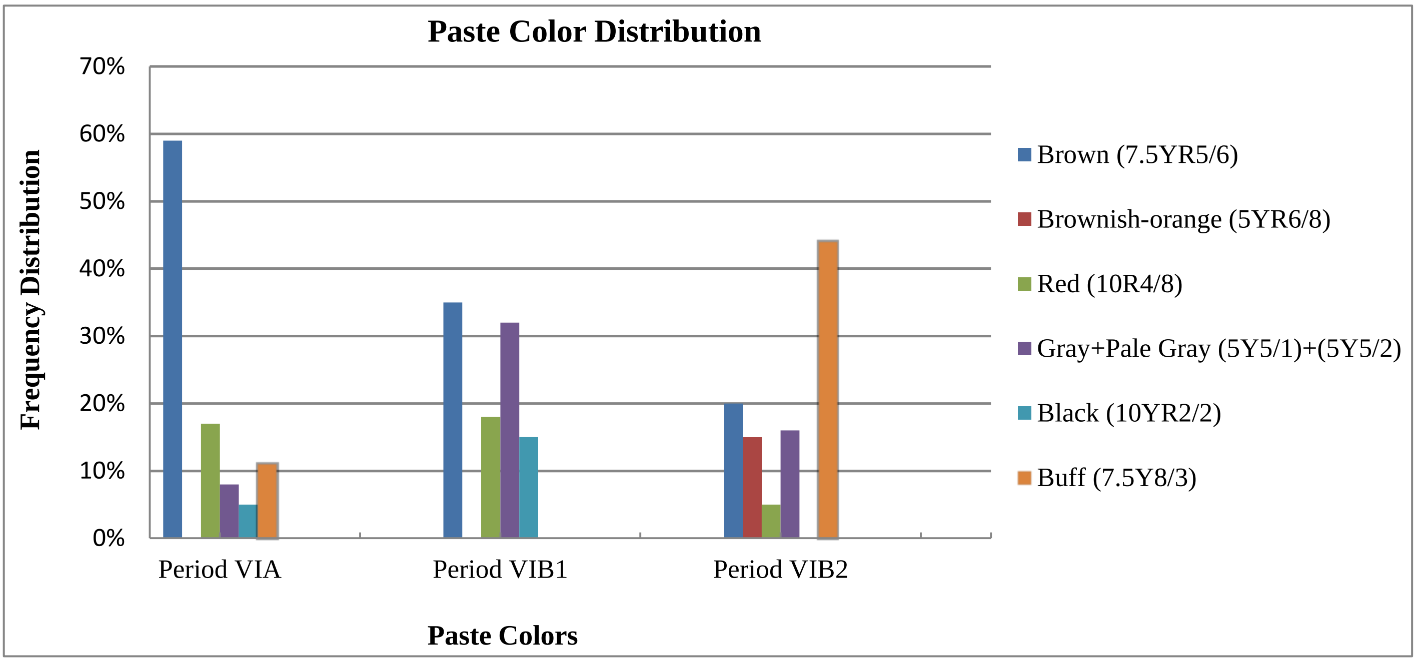
The frequent occurrence of quartz, mica, and schist throughout the pastes probably corresponds to the igneous and metamorphic outcrops which are in close proximity to the site (see chapter 1.2). This is further supported by the presence of significant amounts of grit 1, grit 2, and grit 4 inclusions in the pastes and which based on their descriptions (see chapter 3.1) and the petrographic groups may be fragments of Ti-ore or Fe-ore, olivine, or rocks with the mineral serpentine, and gabbro. These rock types are related to the Baskil and Yüksekova outcrops about six kilometers (6km) east from the site of Arslantepe (Fragnoli and Palmieri, forthcoming). An interruption in the raw material procurement pattern was observed in Period VIB1 which is characterized by mainly red-black and monochrome burnished production. Grit 3 and chaff were the most dominant inclusions (see Tab.3). The observation of grit 3 seems to correspond to the high number of calcareous pastes identified in the petrographic analysis (*Ibid.*). The break in the general trend of raw material procurement, now characterized by the mixture of distinct raw materials coupled with higher proportions of chaff inclusions may be explained on the one hand as the exploitation of new raw materials from the southern metamorphic outcrops (Malatya metamorphics) and on the other hand, a deliberate act by the prehistoric potters to achieve a distinct paste type and texture for the functions assigned to the ceramic class. Leaning towards a social theoretical perspective, this interruption may be gleaned as a technological expression of social identity by the Arslantepe potters during this Period. The increase in the addition of chaff to the paste is also technologically advantageous for the ceramic repertoire characterizing this Period. Since most of the shards are red-black, it seems that the chaff inclusions were used to facilitate the firing of the vessels. Fragnoli and Palmieri have also suggested that this change may have been as a result of specific and regular manufacturing choices. Similar trends have also been observed in the pastes of the few red-black burnished vessels in Period VIA. However, it is worthy to note that even though similar tendencies exist between the red-black burnished pastes of Period VIA and VIB1, the general ceramic repertoire and typological forms are vastly different. Red-black burnished shards of Period VIA are suggestive of central Anatolian models, while those of Period VIB1, show closer affinities with the Transcaucasian elements. (Frangipane and Palumbi 2007; Palumbi 2008 in Frangipane and Palmieri, forthcoming).

By comparing the results obtained from the macroscopic analysis with the results from the petrographic analysis as well as using a detailed geological map of the area, the non-plastic inclusions present in the pastes were consistent with the geology of the area. However, it should be stressed that, in order to confirm with certainty the similarity of the minerals and rocks present in the ceramic pastes and those available locally, an extensive research involving a comparison between the inclusions and the local rock formations of the area has to be carried out.

In sum, the macroscopic examination and the comparisons between the ceramic pastes from the chronological phases investigated in this research suggests a general diachronic path in the raw material procurement and paste preparation processes. Quartz, mica, and schist are the most common mineral and lithic inclusions observed in all the pastes with certainty (see Tab. 3). Two main trends can therefore be defined here; the first relates to Periods VIA and VIB2 when igneous and metamorphic rock fragments were the primary inclusions in the paste coupled with quite considerable amounts of chaff and grit 5 inclusions. The second trend corresponds to Period VIB1 when the use of chaff became dominant alongside grit 3 inclusions. Thus, Periods VIA and VIB2 show substantial uniformity due to temporal continuity in both selection of raw materials and the amounts used.

3.3.4: Paste, Surface Colors and Firing

The range of paste colors from each of the Period was basically similar, however, some variations were observed in the quantitative distributions across the chronological phases (Tab.7). Dark toned pastes such as brown, black, gray and red were more common in Period VIA and VIB1 than in Period VIB2. No black colored paste was present in Period VIB2. The light colored pastes in Period VIA – buff and pale gray, was also observed in Period VIB2 alongside other light-colored pastes such as brownish-orange. The frequency of paste color distribution varies significantly across the Periods. In Period VIA and VIB1, brown colored pastes were the most occurring (59% and 32%, respectively), while in Period VIB2, buff colored pastes were the most frequent (44%). Brown pastes were also moderately present (20%). Gray+pale gray pastes occurred in all the ceramic assemblage examined, but they were well attested in VIB1 and VIB2 (32% and 16%, respectively). Brownish-orange pastes (15%; also see fig. 18a-b, 20a, e) were only observed in Period VIB2 (Appendix x).



Appendix x: Quantitative Distribution of Paste colors in Periods VIA, VIB1 and VIB2

Vessel surface colors varied quite extensively. Both sides of the 158 shards were examined for color. The dominant surface colors were the different shades of brown, gray, and buff. In Period VIA, 5% of the internal surfaces of the shards had black color, 9% produced different shades of gray, 16% were observed with different shades of red color, 61% were different shades of brown, and 9% were observed with buff color. On the external surfaces, 5% of the shards were black, 7% were gray, 19% red, 56 % brown, and 13% with buff colors. In Period VIB1, 28% of the shards were observed as having black color on the external surfaces, 16% were gray, 12% were red, and 44% were brown. On the external surfaces, 31% of the shards were black, 24% gray, 25% red, and 20% brown. There were no buff colored surfaces observed in this Period. In Period VIB2, 13% of the shards had gray colors on the external surfaces, 16% were red, 26% were brown, and 45% were with buff colors. On the external surfaces, 12.5% were gray, 18.5% were red, 25% were brown, and 45% were buff. Shards with black colored surfaces were not observed (Tab.4). It should be noted that the color shade variations may in part be due to the repeated use of the same vessel for cooking and to post-depositional effects associated with weathering and ground water.

Attention was paid to the red-black burnished productions. It seemed that these vessels required special skills to achieve the different pattern of colors. For the production of black colored surfaces, a variety of methods, including firing in reduced atmosphere, use of coatings made from organic substances, and smudging was required (Hawley, 1929:736). It is probable that the black surface colors of the Arslantepe vessels were achieved through smudging. This inference is based on the consideration that firing in an oxidizing atmosphere could not have achieved this result. This is because the reduction of iron oxides, which gives the black color effect does not start below 900°C. The observation of frequent dark cores in some of the vessels during the macroscopic investigation and preserved organic matter observed during the petrographic examination (Fragnoli and Palmieri, forthcoming), suggests that the majority of Arslantepe vessels were fired at quite low temperatures in uncontrolled conditions. Smudging of vessels is done toward the end of firing by adding to the burning fuel and the pottery with a smoke producing substance such as green leaves or dry manure. The effect of the different color on each of the vessel surface were achieved by covering the part that is intended to be black from contact with air. On the other hand, it can also be argued that both smudging and firing in a reducing atmosphere may have been used to achieve the black color depending on the vessel forms. Open vessels with internal black surface may have been achieved by firing the vessels in an oxidizing atmosphere with the vessels turned upside down, thus preventing the circulation of air to that part (reduction), while the close vessels with external black surface were probably achieved through smudging. It should be noted that this argument is on hypothetical basis hence a need for further studies or experimental analysis to confirm the hypothesis. The technological expertise that was required to produce these types of vessels should not be underestimated. The potters required skill in selecting the stage at which the smudging began and a crucial control of the firing atmosphere to ensure uniformity.

Core effects were observed in some of the pale gray and buff colored pastes in Periods VIA and VIB2. No cores were observed in the VIBI vessels (Tab.4). A total of twenty-two (22) samples from Period VIA (Fig. 7b-c) and six (6) samples from Period VIB2 (Fig. 18f; 19b) show carbon cores; an interior band of gray to black sandwiched between two lighter layers of paste. This kind of carbon core is the result of incomplete oxidized organics found within the original clay used to make a vessel (Rye 1981; Rice 1987:334). A different kind of light grayish brown core is also observed in four (4) of the samples from Period VIA (See fig. 7d). The presence of these cores suggests that the vessels were fired at relatively low temperatures in uncontrolled conditions.

3.3.5: Paste Hardness

Paste hardness was not measured in a quantifiable manner. It was estimated subjectively by the degree of pressure it took to remove a small chip of pottery from each shard using a pair of pliers, or using the finger nail on the fractured shard. In general, the paste ranged from hard to relatively soft. The hard pastes correlate to the buff to pale gray colored pastes, while relatively soft pastes correlate to the brown to black colored pastes. According to Rye (1981:121), if a shard breaks easily with a friable edge, it was probably fired below or up to about 750ºC. The vast majority of the shards analyzed for Period VIB1, and the red-black burnished shards in Period VIA broke in this fashion. The lines of evidence suggest that the dark brown to dark gray and black pastes of Period VIA and the pastes of Period VIB1 were probably fired at a relatively low temperature in comparison to Period VIB2 vessels which were relatively well fired (for example, the very fine wheel-made, buff colored vessels). For Periods VIA and VIB1, the predominance of various shades of brown, red and black surface and paste colors, monochrome, carbon cores (observed in some of the buff colored pastes), and relatively soft pastes (friable) suggest that the vessels were fired in an uncontrolled environment or they were fired in an open air where the firing atmosphere is highly variable (see Rye 1981:96-98). Tables four (4) and seven (7) summarize data on the frequency distribution of core effects, surface, and paste colors.

Chapter Four: Discussion and Interpretation

In this section, I present a more detailed discussion of the results reported in chapter 3 along with possible interpretations. This research is a diachronic comparative analysis of Arslantepe ceramics designed to direct the following central questions: 1. Whether variations in the paste relate to different raw material acquisition patterns and paste preparation modes? 2. Is the variability in the technological choices of the Arslantepe potters related to changes in the ceramic repertoire and types? And 3. Does craft specialization in Arslantepe, as remarked in the highly skilled wheel-made vessels, necessarily imply craft?

In order to resolve these queries, I reviewed both internal and external elements that may have influenced variations in ceramic production at Arslantepe. For internal factors, I determined if the geographical and geological location of Arslantpe played any role in the technological choices made during ceramic production. In addition, an attempt was made to identify the roles that internal politics – socioeconomic and religious activities played that caused variations in the ceramic assemblage. The Syro-Mesopotamian – Late Uruk, Anatolian, and Transcaucasian traditions interacted in one way or the other with Arslantepe. Such interactions have been mentioned in many of the Arslantepe ceramic repertoires and other material cultures that are corresponding in many ways to those from these traditions. Nevertheless, the extent of interaction that existed between these cultural entities and Arslantepe needs to be established. For this, an attempt was also made to determine the relationship or interaction that may have existed between these external polities and Arslantepe.

The macroscopic examination of the ceramic assemblage shows both variations and continuities in the ceramic production processes within and across the various Arslantepe settlement phases. The variations and continuities can be defined along geological, socioeconomic and political, as well as intracultural and cross-cultural lines. In general, comparable trends were observed between Period VIA and Period VIB2 as they were characterized by the predominant use of lithic and mineral components located east of the Arslantepe site. Period VIB1 appears to be an interruption marked by the exploitation of new sources located south of the tell (Fragnoli and Palmieri, forthcoming). The variations in paste types and typological repertoire during Period VIB1 probably correspond to the abrupt interruption that occurred between 3000–2900 BCE marking the end of the Late Uruk influence on pottery manufacturing traditions that were observed in Period VIA. Thus, the geological and immediate environmental conditions were very influential in the selection of raw materials and in the technological choices made during the ceramic production processes. The raw materials exploited for producing pottery matched local deposits and were located in close proximities to the site.

Examining paste frequencies by general ceramic groups or typology has promoted a more detailed description of ceramic change across the chronological phases (see appendix iii & iv). The introduction of the red-black burnished production initiated many changes in the overall ceramic assemblage. The variations in raw materials and paste preparation modes suggest that certain paste types were preferred for certain ceramic vessel types. This hypothesis is evidenced in the limited variations observed in the pastes of vessels belonging to particular typological forms over other forms. For instance, coarse pastes were preferred over medium-fine pastes to manufacture mass-produced bowls and some very large necked jars, while medium-fine pastes were preferred in making goblets, fruit stands, medium, and small necked jars (discussed in chapter 3). The pastes of the red-black burnished vessels in Period VIA and VIB1 show strong variations from the pastes of the other ceramic classes. Thus, they present high frequencies of chaff inclusions alongside mineral and lithic fragments. The wheel-made productions of Period VIA and VIB2 show strong continuity in the choice of raw materials, probably referring to the exploitation of similar outcrops. The pastes of Period VIB1 (largely consisting of red-black and monochrome burnished vessels), show great variability in reference to raw materials and in paste type and ceramic form correlations. A well-defined correlation is absent among the pastes of the red-black burnished pottery and the typological forms. The variations identified are probably due to the production methods observed by different manufacturing centers and cultural agencies that may have existed on the site. It is also possible that the red-black burnished vessels were probably produced at a very local level, while the wheel-made and reserved-slipped productions were the reserve of skilled and experienced potters. It is also likely that the handmade red-black burnished production which came to dominate Period VIB1 were probably made and used by the transhumant herders, with close ties to the Transcaucasian traditions. They occupied the area after the collapse of the Period VIA centralized system and interacted with the local culture. This is further demonstrated by the significant spread of the main features and production technologies used for the red-black burnished vessels throughout the vast area ranging from North-Central Anatolia to the countries south of the Caucasus, differing in terms of repertoires, profiles and specific traits from one location to another. Nevertheless, it is merely on the northernmost part of the Upper Euphrates Valley that the techniques and artistic characteristics of Central Anatolian origin conflated with shapes and repertoires from the Kura-Araxes tradition (Palumbi, 2008b and 2012, also see Frangipane–Paléorient, 2014). I agree with Fragnoli and Palmieri, who have suggested that the difference in production technology of the red-black burnished vessels from the other ceramic classes and the lack of assimilation through time may relate to different producers aiming at preserving their identity (Fragnoli and Palmieri, forthcoming).

Technological continuities and innovations suggested from the examination of the ceramic assemblage are probably due to the effect of Arslantepe's heterogeneous cultural relations with its neighbors, near and far, in connection with socio-economic and political growth. Arslantepe became a very powerful political and economic center with the ability to control the Malatya plain and almost certainly to interact from a dominant position with its neighboring regions and populations. The relations Arslantepe had with the northern centers and the southern societies in general have always been considered a prominent one (Frangipane, 2014). Evidence of these relations has been established by the presence of material cultures–ceramic classes, power and economic systems (centralized power), suggesting the existence of some kind of interaction. However, the question about the nature of these relations and the degree of influence the southern societies exercised over the development of the local communities still persists. There is then the question of whether these southern people were southern communities pushing northwards in search of raw materials or 'groups of settlers' who had settled in the north for a variety of reasons, or the same societies of Upper Mesopotamia who had been hybridized by this contact (Rothman, 2001; Frangipane, 2014).

During Period VIA, the interaction between Arslantepe and the Uruk area may have led to developments of the economic centralization system and an increase in the power of the local elites. These interactions, as Frangipane (2014) outlines, did not interfere with the management of central activities by the elites and also did not disrupt the specific features of their internal and external system of relations. It is evident that though Arslantepe incorporated the centralized and redistribution systems of the Mesopotamian world into its own system of organization, it also exhibited a wide variety of local features. The intensified relations Arslantepe had with the southern Late Uruk groups and with its northern outposts and the significant presence of central Anatolian elements in its cultural circle, without any evidence of cultural assimilation whatsoever only goes to proof the autonomous development of Arslantepe. This level of interaction replicates in their ceramic assemblage which is distinguished by a fundamentally local trait, even if it shares some characteristics of the Late Uruk production such as the wheel-made light-colored pottery, reserved slip decorations, and the mass-produced bowls (Frangipane and Palmieri, 1983:366). The repertoire is reduced in complexity with respect to the Syro-Mesopotamian contexts as far as both the number of functional classes and typological varieties within each class are concerned. Much of the inventory of Late Uruk profiles is absent from Arslantepe, whereas they have been observed at related sites such as Habuba Kabira (*Ibid*.), this goes further to support Arslantepe's dominating position during this Period. Arslantepe repertoire in comparison with sites on the Turkish Euphrates such as Hassek, located at the south of Taurus, and Tepecik, farther north, is remarkably autonomous, although it has some general affinities with Late Uruk characterization. The pottery inventory of Tepecik and Hassek largely includes shapes of a clear Late Uruk typology. Another ceramic class, comprising the handmade red-black burnished vessels with seemingly close relations to the central and north-eastern Anatolian productions is represented. The functional range of the red-black burnished vessel is characterized by handled and handless bowls, medium and large bowls with flat bases, cups, and fruit stands. The presence of these central Anatolian traits at Arslantepe could demonstrate a certain degree of influence from Central Anatolia over some of the cultural traditions and over some sectors of the ceramic production of the Upper Euphrates Valley in the second half of the fourth millennium (Frangipane, 2000a:447).

In a Period characterized by Syro-Mesopotamian Uruk elements closely associated with the expressions of the groups in power, the adoption of these new Anatolian traditions may have been intentionally instituted by certain factions within the settlement as a manifestation of the dynamics involved in establishing a competing set of political relations and cultural references (Palumbi, 2008). The stimulus – the setup of new groups in the local setting or the acceptance and absorption of new northern traits by some parts of the population – that may have activated these connections remains intriguing. By observing the changes in the material culture that developed in Arslantepe few years after the collapse of the centralized structure at the beginning of the third millennium, Palumbi offers an explicable proposal suggesting that the presence of models alternative to the Syro-Mesopotamian ones could have already been more rooted in the local web than readily apparent; in other words, the apparatuses of ideological representation under the control of the local elites could have deliberately ignored and subdued the visibility of alternative models (Palumbi, 2008:103).

During this period, Arslantepe probably had a major role as an intermediary center in the vast network of inter-regional relations involving the Syro-Mesopotamian communities and those living in the mountain areas of central-eastern and northeastern Anatolia while at all times retaining its marked autonomy (Frangipane, 2012:980). The process of constructing these common links stemmed from the accretion of common economic (trade and commerce) interests in specialized practices, for example in metallurgical production. Ultimately, Arslantepe Period VIA can be described as a dominant center, which probably reorganized its pottery repertoire, incorporating new elements and expanding relations with neighboring communities in response to its growing centralized structure.

During Period VIB1, the area was probably occupied by groups of transhumant pastoralists who may have been previously moved around the region joining it to a vast system of relations with the eastern Anatolian and Transcaucasian world, with which they shared customs and cultural features (Frangipane, Di Nocera, and Palumbi, 2005). Their settlement was mostly temporary, made of wattle and daub, and the centralized system which characterized Period VIA was no more in existence. The history of power at Arslantepe was now characterized by fluctuations, abrupt transformations, and regressions. A new political system emerged in which power seems to have been based on the capacity to manage conflicts (Frangipane, 2013:239).

The radical change from the 4th millennium traditions is also tangible in the ceramic repertoire of this Period, which is characterized by a hand-made burnished ware reproducing formal repertoires which plainly recall those of the contemporary settlements in the Southern Caucasus (for example, Kura-Araxes culture; also see Fragnoli and Palmieri, Forthcoming). The most common pottery categories are the red-black burnished vessels, monochrome burnished vessels, and the rare black burnished vessels.

Using the *technological style* approach in association with the production and maintenance of social identity, it may be viable to explain the motivation for adopting the Southern Caucasus elements (e.g., Lechtman 1977; Dobres 2000; Lemonnier 1986, 1992; Pfaffenberger 1988, 1992). People modify how they identify themselves according to factors that will increase their advantage in various contexts, for example, trade, commerce, and the exchange of essential or specialized products such as metals. The adoption of the red-black burnished vessels with other elements related to the Transcaucasian culture could have been part of a range of shared material culture which probably served to create a common platform and mediate interactions. It is also probable that after the collapse of Period VIA, Arslantepe sought new exchange relations or attempted to intensify relations with already established partners. Adopting the red-black productions may have been one of the material elements of the reorganization of social identity and alignment with other cultural elements in the Malatya plain and surrounding areas.

Recent studies on Period VIB1 have however suggested a different interpretation from the erstwhile conception that this phase was a rather temporary occupation of pastoral groups from the Southern Caucasus evidenced by the marked “Kura-Araxes” character of the material culture. The new interpretation points to interesting elements of continuity. Arslantepe still maintained its central role in the Malatya region and continued the pursuit of some specialized traditions, for example metallurgy (Frangipane, 2014). The evidence now documents this phase of Arslantepe settlement as the temporary appropriation of the site by mobile, probably transhumant groups moving in a wide area around the plain and already well-rooted in the region and forming a system of hybridization, rather than a momentary intrusion of pastoral communities of Transcaucasian origin. The lack of decorative patterns on the majority of the VIB1 ceramic assemblage does not fit into the ceramic traditions of the 3rd millennium Southern-Caucasian communities. Also, the presence of circular hearths with a central hole observed in the Period VIB1 context constitutes a typical feature of the domestic traditions of the Upper Euphrates Valley dating back to the 4th millennium. The South Caucasian region hearths were different in terms of both their shapes (horseshoe shaped or three-leaf shaped) and plastic decorations (human, animal), absolutely typical of the Kura-Araks culture (Frangipane *et al.* 2005). The material culture, ranging from ceramic types to hearths among other material culture, relating to the Upper Euphrates Valley, Eastern Anatolia, and the Southern Caucasus provides a good sense of the existence of a hybridized society at this phase of the Arslantepe settlement.

This system of hybridization probably became conceivable after a fallow period following the collapse and destruction of the main political centers of the 4th millennium. This collapse of power may have prompted a political and cultural crisis in the Upper Euphrates and the response to this situation was perhaps a redirection of interest towards new political and cultural standards, including the Kura-Araks regional pole, which at the beginning of the 3rd millennium was exercising a powerful influence over Eastern Anatolia (Palumbi, 2008:235). Period VIB1 with its series of settlement unfolds the existence of new social and cultural entities in the Malatya plain from the beginning of the 3rd millennium. A number of Arslantepe researchers have defined this phase as the moment in which a series of new elements were definitively introduced, and which contributed to the building up of a new regional identity composed of a network of local traits and of traditions borrowed from surrounding regions such as the Southern Caucasus and North-Eastern Anatolia (Palumbi, 2008; Frangipane *et al*, 2005; Frangipane *et al,* 2007).

During Period VIB2 we see renewed links of interaction with the south, which seem to have been interrupted during Period VIB1. However, these renewed links were now in a more restricted area along the Upper Euphrates valley and as far as North Syria (Frangipane and Palmieri, 1983:542). Unlike Period VIB1, the settlement is now stably occupied and characterized by a return of the traditional mud brick building techniques of Period VIA. However, the social organization of Period VIB2 is structurally different from that of the 4th millennium Arslantepe community. Individual households now autonomously managed their own production activities without the mediation of political entities, indicating the absence of systematic forms of controlling and mobilizing labor force – specific features of the Period VIA administrative system.

The pottery was mainly related to the Early Bronze I cultures of the Middle and Upper Euphrates valley, where the new societies had inherited forms and technologies derived from the Syro-Mesopotamian Late Uruk traditions (Frangipane, 2012). With the presence of ceramic repertoires and other material culture related to the Syro-Mesopotamian Late Uruk traditions and the Anatolian traditions on the same sites, Palumbi theorizes that function, manufacturing tradition, and other spheres of production could have been closely interrelated (Palumbi, 2008). Ceramics belonging to the Syro-Mesopotamian traditions, which supposedly refer to specialized workshops, and those belonging to Anatolian traditions, whose origins may have been in the domestic production sphere, were integrated within the same cultural, functional and production circle. The spatial and functional split between wheel-made and non-wheel-made vessels may have been due to the different spheres of production, connected with totally different cultural models and productive traditions. Although the material culture of Period VIB2 was to a certain extent inherited from the 4th millennium elements and traditions, its composition was much more complex. It was capable of interfacing with different geographic areas and cultures, i.e. the northern Syrian communities south of the Taurus, the north-eastern Anatolian cultures and perhaps also the Kura-Araks world. In Palumbi's words, the material culture of Arslantepe Period VIB2 possessed a combination of features typical of a frontier area at a time of historical, political and cultural transition (Palumbi, 2008:254).

Different phases of the ceramic production in Arslantepe Periods VIA, VIB1, and VIB2 have been outlined in the face of striking variations and continuities. It is evident that each of the cultural phases had distinct features which defined their cultural territory. The whole ceramic assemblage as well as other related material culture suggests that these regional horizons were very active in interacting with their neighbors and other external factions as well as incorporating new cultural ideas into their circle, while maintaining a dominant position and preventing any form of cultural assimilation. To this point, we can say that the variations and continuities mirror the socioeconomic, political, and cultural changes that took place in Arslantepe on a territorial as well as on an extraterritorial level.

Chapter Five: Summary and Conclusion

The aim of this research was to define the main characteristics of technological and compositional variability of ceramic productions in Arslantepe periods VIA, VIB1 and VIB2 (3350-2800BC). This thesis provides significant insights into the nature of ceramic production and its evolution over time. The study also advances our understanding of the processes that resulted in the adoption of different material culture into the Arslantepe cultural system without any form of cultural assimilation. Different manufacturing and production techniques have been outlined for the ceramic assemblages of the cultural phases examined. Variations and continuities in technological choices mirror the socioeconomic, political, and cultural changes that took place in Arslantepe Periods VIA, VIB1, and VIB2 on territorial as well as extra-territorial levels. Using the concepts of *technological style* and *technological choice*, I have been able to make some preliminary conclusions about the choices of these potters and the factors which may have influenced their need to make these choices.

Five main paste groups were defined for the whole ceramic assemblage (see Tab. 12). These include fine to semi-fine pastes with exclusive mineral and lithic inclusions (group 1), coarse pastes with exclusive mineral and lithic inclusions (group 2), fine to semi-fine pastes with mixed inclusions (chaff+mineral+lithic, group 3), coarse pastes with mixed inclusions (group 4), and very fine gritty pastes (group 5). The majority of the shards from Period VIA (30.1%) belonged to group 1. The diagnostic fragments were mainly associated with reserved-slip medium to large jars, small to medium necked jars, beaked bowls, and hand-made kitchen pots. With the hand-made kitchen pottery, only 4 shards were identified, therefore it is quite difficult to assign to a specific paste group due to the lack of recurrence. Only 3.2% of the shards belonged to group 2. The diagnostic fragments were associated with

3 medium necked jars, 1 red-black burnished bowl, and 1 kitchen pot. Shards belonging to group 3 formed 8.5% of the ceramic assemblage. Three (3) red-black burnished bowls and 1 small jar, and 9 medium to small necked jars were identified with group 3. The red-black burnished jars (5 shards) from this Period were identified with group 4. A limited number of shards were identified with group 5. Only four shards, associated with reserved-slip medium jars and small necked jars were observed with this paste type.

During Period VIB1, a dramatic change in the selection paste type was observed. The majority of the shards was identified with groups 3 (10.1%) and 4 (11.4%), while only 4.4%, 3.5% and 2.5% of the shards were identified with groups 1, 2 and 5 respectively (also see appendix iv). It was observed that this Period presented a wider functional repertoire, but provided limited information when they were correlated with the paste groups. As mentioned earlier, most of the shards were identified with groups 4 and 5, however, this does not seem to be a strict technological practice or pattern. Any of the typological forms or functional classes may be made from any of the five paste categories. For example, some of the red-black burnished bowls and burnished monochrome jars were observed in both groups 3 and 4. Some of the jars and bowls were also sparsely distributed among groups 1, 2, and 5 (see Tab. 2b & 12).

The shards from Period VIB2 formed part of only 3 out of the 5 paste groups. The shards were primarily identified with group 1 (11.4%) and group 3 (6.3%). Only 2.5% of the shards were labelled with group 2. Shards belonging to group 1 were associated mainly with reserved-slip medium to large jars. Other typological forms infrequently distributed in this group were also observed as reserved-slip bowls (2), 1 red-slip high-stemmed fruit stand, 3 medium/small jars, 1 spouted jar with perforated lags, and 1 footed goblet. Shards belonging to group 2 were associated with 1 red-slip high-stemmed fruit stand and 3 reserved-slip large/medium jars. The remaining shards were mainly associated with small and medium necked jars, 1 red-slip high-stemmed fruit stand, 1 light-colored bowl, and 1 footed goblet. These shards belonged to group 3.

General characteristics of the ceramic assemblage from each of the Periods examined were distinguishable from each other in terms of typological forms, characteristics of principal inclusions (dimensions, shape, color, concentration, distribution, and orientation), vessel forming techniques, surface treatments, colors and firing techniques. Period VIA ceramic assemblage presents light-colored coarse shards corresponding to the mass-produced bowls and some very large necked jars, light-colored fine to semi-fine shards corresponding to reserved slip jars of various dimensions, plain medium and large oval jars and small necked jars. The hand-made kitchen pottery from this Period corresponds to hand-made buff-brownish red color pots of various dimensions. A different production range represented by the handmade red-black burnished vessels were also observed and comprised bowls with or without handles and small globular jars. The ceramic assemblage of Period VIB1 was radically different from Period VIA. The most common ceramic class was the red-black and monochrome burnished shards. A single gritty fine black burnished shard was also observed among the assemblage. The ceramic repertoire comprised mainly of jars, jarlets, bowls, and two-handled jars. During Period VIB2, a return of the wheel-made and reserved-slip production was observed. The ceramic assemblage of this Period consists of very fine wheel-made production characterized by pale to buff colors corresponding to some goblets, spouted jars with perforated lags, and bowls, and the fine to semi-fine productions corresponding to the necked jars (with or without reserved slipping), reserved slip bowls, goblets, light-colored bowls, and red-slip high-stemmed bowls (see Tab. 12).

The most obvious correlation between paste type and vessel morphology was marked in Periods VIA and VIB2, even on a small scale. Observed from the macroscopic analysis, it is possible to say that in Period VIA coarse pastes were preferred to make mass-produced bowls, whereas fine to medium-fine pastes were used to manufacture necked jars, beaked bowls, and hand-made kitchen pots. The red-black burnished shards in this Period formed only 18% of the total ceramic assemblage and did not show a particular affinity towards any paste category, however, the pastes of most of red-black shards analyzed had mixed fabric with a coarse texture. In this regard, I cannot unquestionably conclude on paste category and typology correlation for the red-black burnished vessels in this Period because of their relatively low presence among the ceramic assemblage and lack of recurrence. During Period VIB2 it was observed that the pastes with a fine to medium texture were used to manufacture the necked jars (with or without reserved slip), bowls, and the red-slip high-stemmed bowls, while the fine gritty pastes with very fine texture were observed in the goblets, spouted jars, and some light colored bowls. It can be implied that these were deliberate choices made by the potters depending on the function of the vessel. The coarse mass-produced bowls were made with coarse texture pastes without any surface finishing treatment, probably because they were temporarily used to serve and redistribute food, whereas the necked jars or goblets were made with medium-fine or very fine pastes because they may have had special functions linked to the long-term storage of liquids. On the other hand, the ceramic assemblage of Period VIB1, which was mainly characterized by red-black and monochrome burnished vessels, showed strong variations in raw material procurement and in paste preparation processes in comparison with Periods VIA and VIB2, but lacked any strong correlation between paste categories and vessel typology. This is to say many of the paste categories identified could have been used to manufacture any of the vessel shapes or types (see Appendix iv and Tab.11).

The range of paste and surface colors among the various chronological Periods examined did not show any significant variations. Dark tone pastes (brown, black, gray and red) were more common in Period VIA and VIB1 than in Period VIB2. Black colored pastes were absent in Period VIB2. The light colored pastes in Period VIA – buff and pale gray – were also observed in Period VIB2 alongside brownish-orange pastes, peculiar to this Period. A significant variation in the frequency distribution of paste colors was also observed across the Periods (See Tab.7).

Correlations between paste composition and local geology of the study area and the identification of some paste categories closely associated with various ceramic classes, show how different degrees of production took place on the site. Generally, quartz and mica were observed in relatively high quantities in all of the ceramic fragments. These rock-forming minerals are very common in sedimentary, igneous and metamorphic rocks and are in proximity to the site (discussed in chapter 1.2) In reference to the petrographic groups and macroscopic observations, these outcrops were probably exploited for raw materials for paste preparation. Periods VIA and VIB2 show a significant correlation in raw materials. Both Periods probably exploited raw materials related to the Baskil and Yüksekova outcrops about six kilometers (6km) east from the site of Arslantepe (Fragnoli and Palmieri, forthcoming, also see Tab.3). Chaff and grit 5 inclusions were also observed in Period VIA and VIB2, but in very limited proportions. In Period VIA, the use of chaff was quite significant (8.5%) while the use of grit 5 was very minimal (3.4%). However, in Period VIB2, the use of grit 5 increases quite significantly (10%) while the use of chaff decreases (3%). Economically, grit 5 may have been a better investment than less easily available aplastics (e.g. chaff). The relatively high percentage of grit 5 inclusions observed in Period VIB2 could also be a socially constructed choice by the potters to differentiate themselves from other potters in the area or to serve as a cultural marker. Whether such decisions were made consciously or unconsciously, it is not possible to address with a great deal of certainty. A major break in the use of igneous rocks was identified in Period VIB1 pastes, similarly, the use of metamorphic rock inclusions decreases, while grit 3, grit 6, and chaff became dominant. The break in the general trend may be explained in terms of the exploitation of new raw material outcrops or the experimentation of a mixture of raw materials. By comparing the results obtained from the macroscopic analysis with the results from the petrographic analysis as well as using a detailed geological map of the area, the non-plastic inclusions present in the pastes are to some degree consistent with the geology of the area. However, it should be stressed that, in order to confirm with certainty the similarity of the minerals and lithic components present in the ceramic pastes and those available locally, an extensive research involving a comparison between the inclusions and the local rock formations of the area should be carried out. It is interesting also to note that, even though Periods VIA and VIB2 shared similar inclusion types, paste textures varied. By contrast, Periods VIA and VIB1 showed similar paste patterns, i.e. fine to medium-fine and coarse pastes, whereas Period VIB2 pastes showed fine to medium-fine and very fine mineral gritty pastes (Tab. 2a, b, c, 5 & 8). The most significant element of connection between Period VIA and VIB2 was the similarities in the paste preparation tradition of the wheel-made productions (Tab. 3).

The shared characteristics of ceramic production between Arslantepe and the wider regions, including but not limited to the Syro-Mesopotamian Late Uruk traditions, Southern Caucasus, and Anatolian elements is indicative of material and ideological diffusion as a result of socioeconomic and cultural interactions. The ceramic assemblage of Arslantepe Period VIA was distinguished by local traits, although it shared some general characteristics with the Syro-Mesopotamian Late Uruk production such as the wheel-made and reserved slip productions. The ceramic repertoire had more affinity towards the Syro-Mesopotamian context so far as functional classes and typological varieties are concerned (Frangipane and Palmieri, 1983). A radical change in structure and ceramic production occurs in Period VIB1. This phenomenon saw a decrease or total loss in the Late Uruk influenced ceramic production practices and a rise in Eastern-Anatolian and Transcaucasian influences. The interruption of interaction with the southern regions during Period VIA was renewed in Period VIB2. The ceramic production now seems to resume the Late Uruk tradition, although modifying and introducing new features. This Period brings back the wheel-made and reserved slip productions. In addition to the 4th millennium characteristics, a complex composition of cultural features was also observed. It was capable of interfacing with different geographic areas and cultures, the northern Syrian communities south of the Taurus, the north-eastern Anatolian cultures and perhaps also the Kura-Araxes world. In short, Period VIB2 possessed hybrid features typical of a frontier area at a time of historical, political and cultural transition (Palumbi, 2008:254).

By far, the results of this research indicate that the wheel-made and red-black burnished productions were different, but contemporary, hence suggesting that more than one ceramic production center operated on the site. Technological aspects of the two production classes were probably managed by different potters who did not work together. Considering the variations in the raw materials and interaction with different traditions in the wider regions, it is possible to say that the pastes were changed depending on prevailing circumstances. For instance, the arrival of new peoples with new traditions, the lack of some raw materials, or changes in production technologies. On this note and based on the available evidence, I strongly agree with Angle, *et. al* that intricate levels of interaction existed in the ceramic production processes at Arslantepe. This is further evidenced by the contemporary occurrence of various types of raw materials, careful selection of inclusions for the paste, contemporary presence of several modelling techniques and technologies, contemporary presence of several firing technologies, and the contemporary presence of potters and/or workshops specializing in different types of production (Angle, *et. al*, 2002:70).

On the whole, the continuities and variations coupled with evidence of the emergence and integration of social complexity and economic power held by a class of elites as observed in Period VIA, do not suggest that ceramic production at Arslantepe was totally controlled by a power-holding class. Although some of the vessel class, for example, the wheel-made and reserved slip productions of Period VIA and VIB2, appear to be the work of some skilled specialists and considering the fact that some of the technological innovations and the ceramic repertoire did not percolate the whole ceramic industry of Arslantepe, the theory of standardization may appear to be problematic in our understanding of ceramic production at Arslantepe. It is, therefore, reasonable to say that other factors such as geological, geographical and cross-cultural interactions might have influenced variability in the ceramic assemblage of Arslantepe Periods VIA, VIB1, and VIB2. The incorporation of external cultural elements into Arslantepe's local socioeconomic system without a radical cultural assimilation is underscored by intensified relations with southern Late Uruk groups and evidenced the significant occurrence of central Anatolian, Transcaucasian, and far North Syrian constituents in the Arslantepe ceramic production.

5.1: Prospects for Future Research

Several opportunities for future research emerged from this thesis to investigate prehistoric paste forming and firing strategies. Experimental research will provide answers to questions about prehistoric forming and firing strategies. Such experiments will provide valuable information on the advantages and disadvantages of the use of certain inclusion types in the paste. For instance, we can get an understanding of why chaff was the preferred non-lithic inclusion used by the Arslantepe potters? Were there any economic considerations towards these preferences? Future research can also look into prehistoric firing strategies in order to answer questions about the efficiency of fuel resources that were available to prehistoric potters. We may be able to determine whether the choices made by prehistoric potters concerning fuel for firing the ceramics may have had ecological and technological implications. The results of these future experimental researches, in addition to those results already available will provide a database for comparison with future studies.

5.2: Reflections

This thesis will be a contribution to the field of ceramic technology and Ancient Near Eastern studies. A detailed understanding of the technological choices involved in the manufacture of ceramics can throw light on the socioeconomic, cultural, and political context in which those choices were made, hence providing insights into the prehistoric potters' behavior. The primary objective is to understand ceramic manufacture through the eye of the prehistoric potter, and by so doing, create an impulse into our reconstruction of prehistoric cultures.

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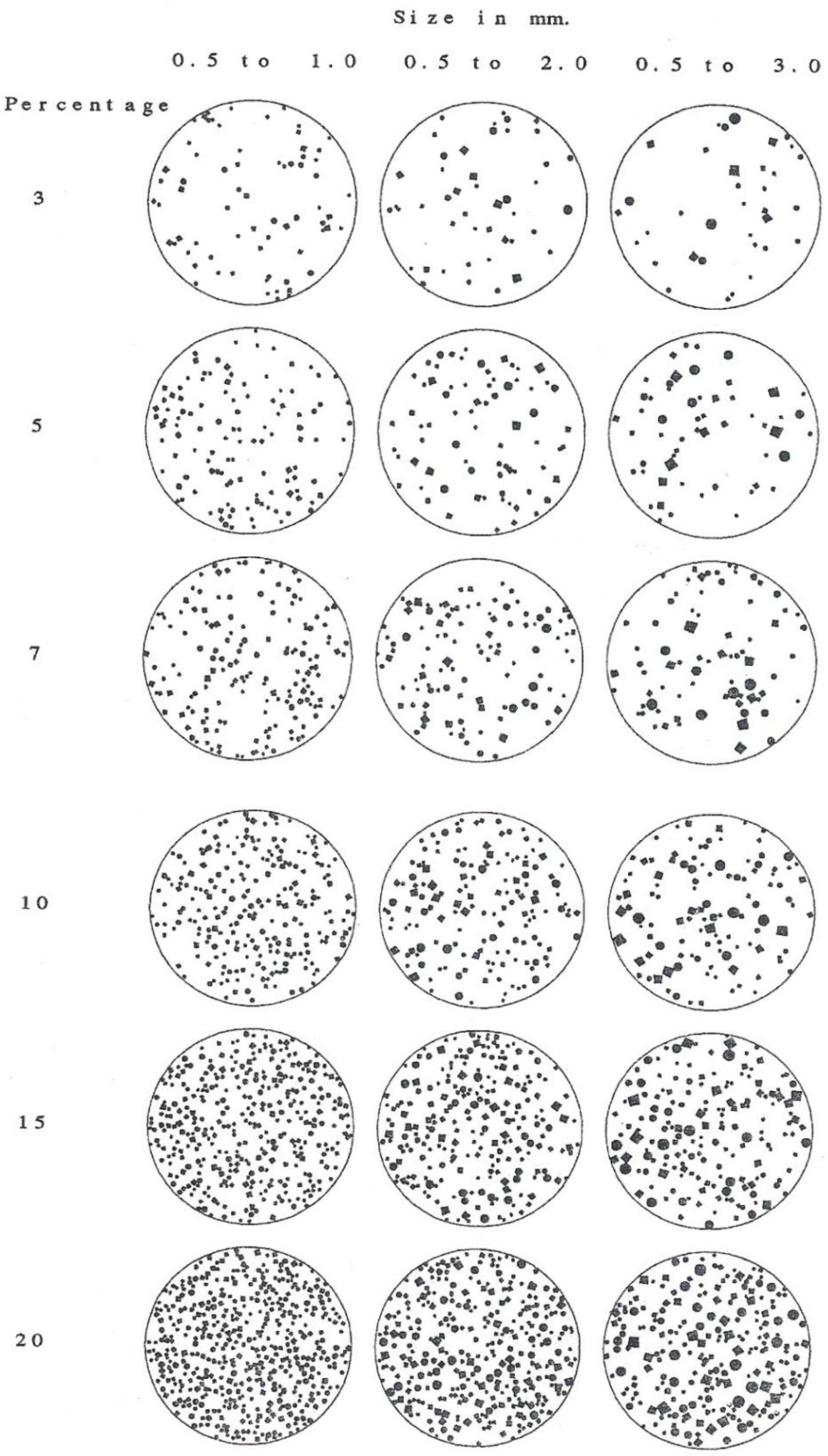
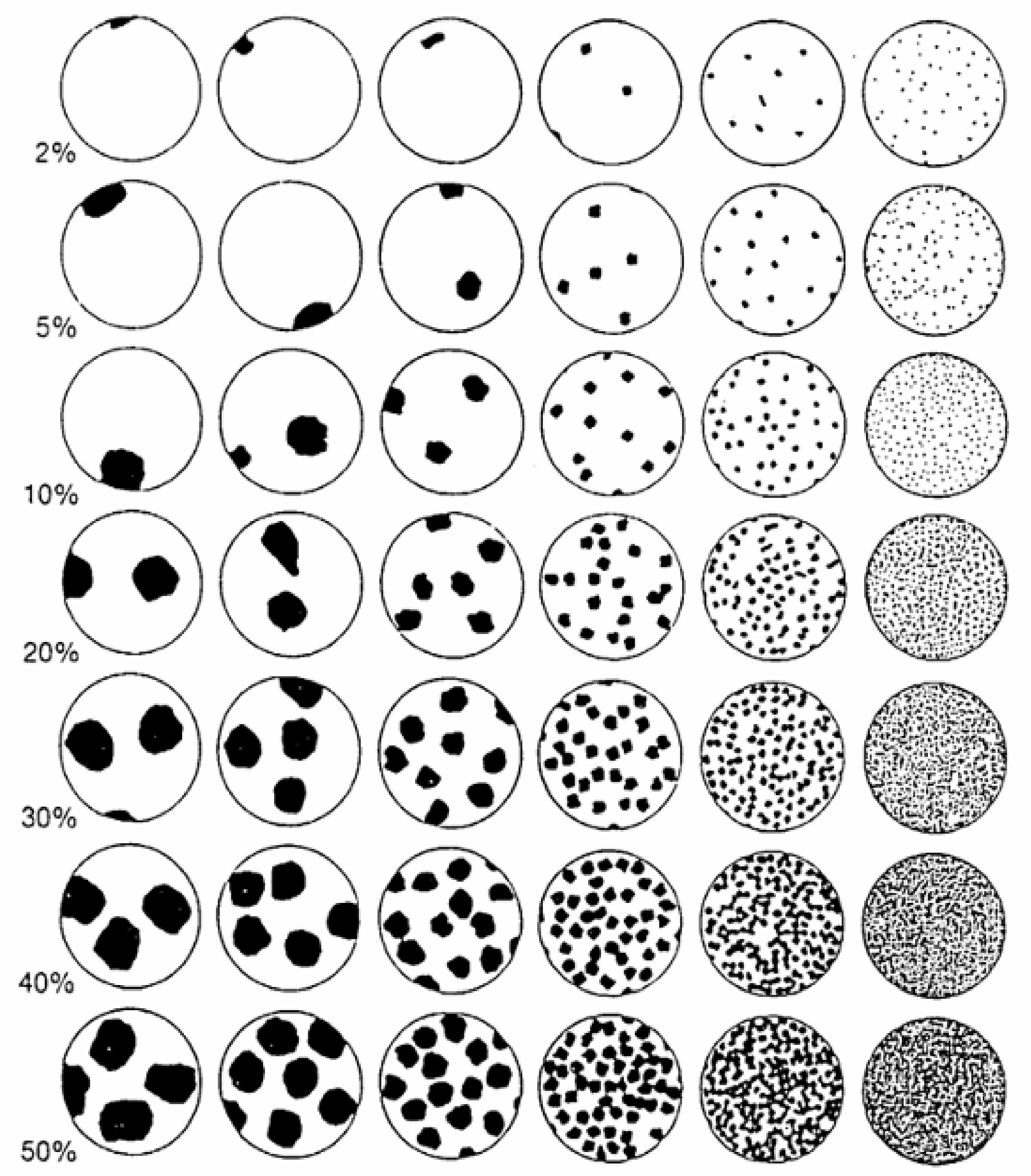
APPENDIX





Appendix i: Frequency distribution of Inclusions based on grain size distribution (Fragnoli, P.)

Appendix ii: Ceramic Technology Form (Fragnoli *et. al*, 2014). Modified

TECHNOLOGICAL SHEET OF CERAMIC ARTIFACT			
Site	**Context**	**Chronology**	**Inventory nr**
Type			
Description:			
Measurement Homogeneity : good □ bad□ **Surface Regularity:** good □ bad□ thickenings□ depressions □ undulation □ other **Other observations:**			
Incrustation amount on the internal surface: low □ medium□ abundant□ **On the external surface:** low □ medium□ abundant□ **In the breaking:** low □ medium□ abundant□ **On the bottom:** low□ medium□ abundant□ **Other observations**			
Analytical technique used for: provenance issues □ technological issues □ other issues: **N° of the sample:**			
Bibliographic references			

<table>
<tr><td colspan="6">Treatment of the surfaces</td></tr>
<tr><td colspan="3">Internal: raw☐ smoothed ☐ burnished☐ highly burnished ☐ damaged☐

Covering: total ☐ partial☐ sporadic☐

Regularity: bad☐ medium ☐ good☐

Shape of the traces: straight☐ curvilinear☐ deep☐ shallow☐ wide☐ narrow☐ striations☐ continuous☐ discontinuous☐

Direction of the traces: horizontal☐ oblique☐ vertical☐ crossed☐

Other observations</td><td colspan="3">External raw☐ smoothed☐ burnished ☐ highly burnished ☐ damaged☐

Covering: total ☐ partial☐ sporadic☐

Regularity: bad☐ medium☐ good ☐

Shape of the traces: straight☐ curvilinear☐ deep☐ shallow☐ wide☐ narrow☐ striations☐ continuous☐ discontinuous☐

Direction of the traces: horizontal☐ oblique☐ vertical☐ crossed☐

Other observations</td></tr>
<tr><td colspan="6">Colors and cooking conditions</td></tr>
<tr><td>Internal surface</td><td>prev.</td><td>spots</td><td>External surface</td><td>prev.</td><td>spots</td></tr>
<tr><td>Black</td><td></td><td></td><td>black</td><td></td><td></td></tr>
<tr><td>very dark grey</td><td></td><td></td><td>very dark grey</td><td></td><td></td></tr>
<tr><td>Grey</td><td></td><td></td><td>grey</td><td></td><td></td></tr>
<tr><td>dark brown</td><td></td><td></td><td>dark brown</td><td></td><td></td></tr>
<tr><td>Brown</td><td></td><td></td><td>brown</td><td></td><td></td></tr>
<tr><td>light brown</td><td></td><td></td><td>light brown</td><td></td><td></td></tr>
<tr><td>dusky red</td><td></td><td></td><td>dusky red</td><td></td><td></td></tr>
<tr><td>Red</td><td></td><td></td><td>red</td><td></td><td></td></tr>
<tr><td>Buff</td><td></td><td></td><td>buff</td><td></td><td></td></tr>
<tr><td colspan="6">Cooking conditions of the paste homogeneous oxidizing☐ inhomogeneous oxidizing☐ semi-oxidizing☐ homogeneous reducing☐ inhomogeneous reducing☐ semi-reducing☐ internal reducing + external oxidizing ☐ internal oxidizing + external reducing ☐ black core☐ red core☐ mainly oxidizing with some reducing spots/lines ☐ mainly reducing with some oxidizing spots/lines ☐

Other observations</td></tr>
</table>

Inclusions

Type of Inclusions:
Shape: angular☐ sub-angular☐ rounded☐ sub-rounded☐

Size/Frequency
Distribution: homogeneous☐ inhomogeneous – by clusters☐ by layers☐ mostly concentrated on the surface☐ protruding from the paste☐

Sorting degree: good☐ (granulometric mode <0.5mm☐ 0.5-1mm☐ 1-2mm☐ >2mm☐) bad☐

Other observations

Clay Matrix

Structure: homogeneous☐ granular because of micro-vesicles☐ granular because of clasts☐ lamellar because of planar voids parallel to the surfaces ☐ lamellar due to clay intrinsic features ☐ fluidal☐

Consistency: very hard☐ hard☐ soft☐ friable☐ removable in flakes☐ pulverulent☐

Water absorption: high☐ medium☐ low☐

Other observations

Porosity

Quantity: low☐ medium☐ abundant☐ **Shape:** planar voids☐ vesicles☐ vughs☐

Max. diameter: (mm) **Orientation:** casual☐ parallel☐

Other observations

Table 1a: Ceramic Groups for Period VIA

Light Colored Pottery	Fine	141, 142, 143, 151, 159, 162, 164, 166, 167, 178, 179, 182, 183, 184, 185, 186, 189, 190, 191, 192, 193, 194, 198, 199, 201, 233, 234, 235, 236, 238, 240, 340, 344
	Semi-fine	150, 152, 153, 154, 157, 160, 161, 165, 169, 176, 181, 196, 197, 200, 213, 214, 215, 217, 239, 243, 244, 341
	Coarse	148, 149, 155, 156
Handmade Red-Black Pottery	Fine	187, 229, 253
	Semi-fine	232, 248, 250, 256, 257
	Coarse	230, 231, 249, 254, 255
Kitchen Pottery	Fine	–
	Semi-fine	175, 158, 168, 218,
	Coarse	–

Table 1b: Ceramic Groups for Period VIB1

Black Pottery	Red-Black Pottery			Monochrome Pottery		
Fine	Fine	Semi-fine	Coarse	Fine	Semi-fine	Coarse
• 302	• 269 • 272 • 273 • 274 • 284 • 285 • 297 • 305 • 306	• 261 • 264 • 268 • 275 • 279 • 281 • 287 • 289 • 295 • 296 • 300 • 301 • 307	• 236 • 238 • 259 • 260 • 262 • 263 • 266 • 267 • 269 • 270 • 276 • 277 • 278 • 283 • 290 • 291 • 292 • 293 • 298 • 299	• 294 • 303 • 304	• 271 • 280 • 287	• 180 • 258 • 265

Table 1c: Ceramic Groups for Period VIB2

Light to Pale Colored Pottery			
Fine		Semi-fine	Coarse
• 309 • 311 • 313 • 318 • 320 • 321 • 322 • 323 • 324 • 325 • 326	• 327 • 328 • 329 • 330 • 331 • 332 • 333 • 334 • 335 • 336 • 337 • 339	• 308 • 310 • 312 • 314 • 315 • 316 • 317 • 319 • 338	–

Table 3: Total Frequency Distribution of Inclusions

Inclusions		Period VIA	Period VIB1	Period VIB2
	Rock Type	%	%	%
Mica	Rock-forming	13	16	19
Quartz	Minerals	29	27	18
Schist	Metamorphic	15.4	7	7
Grit 1	Undetermined	6	0	3
Grit 2	Undetermined	1.7	0	4
Grit 3	Undetermined	1.7	17	7
Grit 4	Undetermined	11.9	0	11
Grit 5	Undetermined	3.4	0	10
Grit 6	Undetermined	9 .4	2	18
Vegetal matter	Chaff	8.5	31	3

Table 4: Frequency Distribution of Vessel Colors and Associated Hues

Color		Period VIA			Period VIB1			Period VIB2		
Internal & External Color		I	E	Core	I	E	Core	I	E	Core
Color	Hue	%	%	No. of shards	%	%	No. of shards	%	%	No. of shards
Black	(10YR 2/2)	5	5	1	28	31	0	0	0	0
Gray Light Gray Very Dark Gray	(5Y 5/1) (5Y5/2) (10YR3/1)	9	7	21	16	24	0	13	12.5	6
Red Reddish Brown Dusky Red	(10R 4/8) (10R 4/4) (7.5R4/4)	16	19	0	12	25	0	16	18.5	0
Brown Light Brown Very Light Brown Dark Brown	(7.5YR 5/6) (7.5YR 6/6) (5YR 5/10) (7.5YR3/3)	61	56	4	44	20	0	26	25	0
Buff	(7.5YR 8/3)	9	13	0	0	0	0	45	44	0

Table 6: Distribution of Surface Treatments

Surface Treatment	Period VIA	Period VIB1	Period VIB2
Burnish	18.4%	78%	–
Smooth	22.4%	–	44%
Reserved Slip	9%	–	47%
Red-slip	–	20%	9%
Decoration	–	2%	–
Untreated	–	–	–
Burnish + Smooth	4%	–	–
Reserve Slip + Untreated	5.2%	–	–
Smooth + Untreated	16%	–	–
Self-slipped	25%	–	–

Table 7: Paste Colors and Associated Hues

Colors	Hue	Period VIA %	Period VIB1 %	Period VIB2 %
Brown	(7.5YR5/6)	59	35	20
Brownish-Orange	(5YR6/8)	0	0	15
Red	(10R4/8)	17	18	5
Gray +Pale Gray	(5Y5/1) + (5Y5/2)	8	32	16
Black	(10YR 2/2)	5	15	0
Buff	(7.5Y8/3)	11	0	44

Table 8: Total Frequency Distribution of Paste Types

Paste Type	Period VIA	Period VIB1	Period VIB2
Semi-Fine	81.5%	46%	69%
Coarse	14.5%	46%	–
Gritty	4%	8%	31%

Table 9: Arslantepe Chronological Sequence

Period VIII	4300-3900 cal B.C.E.	Late Chalcolithic 1 – 2
Period VII	3800-3400 cal B.C.E.	Late Chalcolithic 3 – 4
Period VIA	3350 – 3000 cal B.C.E.	Late Chalcolithic 5
Period VIB1	3000 – 2900 cal B.C.E	Early Bronze Age I – Phase 1
Period VIB2	2900 – 2800 cal B.C.E	Early Bronze Age I – Phase 2
Period VIB3	2800 – 2750 cal B.C.E	Early Bronze Age I – Final Phase
Period VI C	2750 – 2500 cal B.C.E	Early Bronze II
Period VI D	2500 – 2000 cal B.C.E	Early Bronze Age III
Period V A	2000 – 1750 cal B.C.E	Middle Bronze Age
Period V B	1750 – 1600 cal B.C.E	Late Bronze Age I
Period IV	1400 – 1200 cal B.C.E	Late Bronze Age II
Period III	1200 – 600 cal B.C.E	Iron Age

Table 11: Summary of Samples Analyzed from Arslantepe

Sample #	**Period**	**Archaeological Group**	**Description**	**Paste Type (Periods)**	**Grouping**	**Typological Form**
141	VIA	**Light colored fine**	Subclass plain simple with fine paste	**A**	1	Beaked bowl
142	VIA	//	Subclass plain simple with fine paste	**A**	1	Beaked bowl
143	VIA	//	Subclass plain simple with fine paste	**A**	1	Foot of fruit stand
151	VIA	//	Subclass plain simple with fine paste	**A**	1	Medium jar
159	VIA	//	Subclass plain simple with fine paste	**C**	3	Red-Black small jar
162	VIA	//	Subclass plain simple with fine paste	**A**	1	Reserved-slip large necked jar
164	VIA	//	Subclass plain simple with fine paste	**A**	1	Small jar
166	VIA	//	Subclass plain simple with fine paste	**A**	1	Medium necked jar

167	VIA	//	Plain simple class	**A**	1	Large necked jar
178	VIA	//	Plain simple class	**A**	1	Large necked jar
179	VIA	//	Plain simple class	**B**	2	Probably a large bottle/lower part of a medium jar
182	VIA	//	Plain simple class	**A**	1	Small necked jar
183	VIA	//	Subclass plain simple with fine paste	**A**	1	Small necked jar
184	VIA	//	Subclass plain simple with fine paste	**A**	1	Undetermined
185	VIA	//	Subclass plain simple with fine paste	**B**	2	Medium necked jar
186	VIA	//	Subclass plain simple with fine paste	**B**	2	Large necked jar
189	VIA	//	Subclass plain simple with fine paste	**A**	1	Small jar
190	VIA	//	Subclass plain simple with fine paste	**A**	1	Small jar/Spouted bowl??
191	VIA	//	Subclass plain simple with fine paste	**A**	1	Small jar
192	VIA	//	Subclass plain simple with fine paste	**A**	1	Undetermined
193	VIA	//	Subclass plain simple with fine paste	**A**	1	Undetermined
194	VIA	//	Subclass plain simple with fine paste	**E**	5	Undetermined
198	VIA	//	Subclass plain simple with fine paste	**A**	1	Medium necked jar
199	VIA	//	Subclass plain simple with fine paste	**C**	3	Medium necked jar

201	VIA	//	Plain simple reserved slip class	**A**	1	Reserved-slip medium necked jar
233	VIA	//	Subclass plain simple with fine paste	**A**	1	Medium sized necked jar
234	VIA	//	Subclass plain simple with fine paste	**A**	1	Small jar/Spouted bowl??
235	VIA	//	Subclass plain simple with fine paste	**C**	3	Small jar
236	VIA	//	Subclass plain simple with fine paste	**A**	1	Small jar
238	VIA	//	Subclass plain simple with fine paste	**A**	1	Medium/Large necked jar
240	VIA	//	Subclass plain simple with fine paste	**A**	1	Small/Medium necked jar
340	VIA	//	Reserved simple slip (ingobbio)	**E**	1	Reserved-slip large necked jar
344	VIA	//	Subclass plain simple with fine paste	**A**	1	Large necked jar
150	VIA	**Light-colored semi-fine**	Plain simple class	**A**	1	Medium necked jar
152	VIA	//	Subclass plain simple with fine paste	**C**	3	Undetermined
153	VIA	//	Subclass plain simple with fine paste	**A**	1	Large necked jar
154	VIA	//	Plain simple class	**A**	1	Reserved-slip large necked jar
157	VIA	//	Plain simple class	**C**	3	Neck of small jar
160	VIA	//	Plain simple class	**C**	3	Large necked jar
161	VIA	//	Plain simple class	**A**	1	Reserved-slip large necked jar
165	VIA	//	Plain simple class	**A**	1	Medium necked jar

169	VIA	//	Plain simple class	**A**	1	Medium necked jar
176	VIA	//	Plain simple class	**A**	1	Medium necked jar
181	VIA	//	Plain simple class	**A**	1	Very large necked jar
196	VIA	//	Plain simple class	**E**	5	Medium necked jar
197	VIA	//	Plain simple class	**E**	5	Large necked jar
200	VIA	//	Plain simple class	**A**	1	Reserved-slip medium necked jar
213	VIA	//	Plain simple class	**A**	1	Medium necked jar
214	VIA	//	Plain simple class	**A**	1	Large necked jar
215	VIA	//	Plain simple class	**A**	1	Large necked jar
217	VIA	//	Plain simple class	**A**	1	Large necked jar
239	VIA	//	Plain simple class	**C**	3	Reserved-slip large necked jar
243	VIA	//	Plain simple class	**A**	1	Small/Medium necked jar
244	VIA	//	Plain simple class	**A**	1	Reserved-slip medium necked jar
341	VIA	//	Plain simple class	**A**	1	Small/Medium necked jar
148	VIA	**Light-colored coarse**	Plain simple class	**A**	1	Reserved-slip large necked jar
149	VIA	//	Plain simple class	**C**	3	Reserved-slip large necked jar
155	VIA	//	Plain simple class	**C**	3	Anomaly?

156	VIA	//	Plain simple class	**A**	1	Large necked jar
187	VIA	**Handmade Red-Black fine**	Red-Black class	**C**	3	Red-Black Burnished bowl
159	VIA	//	Sub-class Red-Black with fine paste, unburnished internally	**A**	1	Red-Black Burnished small jar
229	VIA	//	Sub-class Red-Black with fine paste, unburnished internally	**C**	3	Red-Black Burnished small jar
253	VIA	//	Sub-class Red-Black with fine paste, unburnished internally	**A**	1	Red-Black Burnished smalljar/beaker
232	VIA	**Handmade Red-Black semi-fine**	Red-Black class	**C**	3	Red-Black Burnished bowl
248	VIA	//	Red-Black class	**B**	2	Red-Black Burnished bowl
250	VIA	//	Red-Black class	**C**	3	Red-Black Burnished bowl
256	VIA	//	Red-Black class	**D**	4	Red-Black Burnished bowl
257	VIA	//	Red-Black class	**A**	1	Red-Black Burnished bowl
230	VIA	**Handmade Red-Black coarse**	Red-Black class	**D**	4	Red-Black Burnished large jar
231	VIA	//	Red-Black class	**D**	4	Red-Black Burnished bowl
249	VIA	//	Red-Black class	**D**	4	Red-Black Burnished large jar
254	VIA	//	Red-Black class	**D**	4	Red-Black Burnished large jar
255	VIA	//	Red-Black class	**D**	4	Red-Black Burnished large jar
175	VIA	**Kitchen Pottery semi-fine**	Kitchen 2	**B**	2	Cooking pot

158	VIA	//	Plain simple class	**A**	1	Very large necked jar/Cooking pot
168	VIA	//	Plain simple class	**A**	1	Cooking pot??
218	VIA	//	Plain simple class	**A**	1	Large bottle/lower part of a jar
302	VIB1	**Black Pottery**	Black burnished	**A1**	1	Black-Burnished small serving jar
269	VIB1	**Red-Black fine**	Monochrome paste with mineral	**D1**	4	Undetermined
272	VIB1	//	Red-black fine mineral paste	**C1**	3	Red-Black Burnished bowl
273	VIB1	//	Red-black fine mineral paste	**C1**	3	Red-Black Burnished bowl
274	VIB1	//	Red-black fine mineral paste	**E1**	5	Red-Black Burnished bowl
284	VIB1	//	Red-black fine mineral paste	**C1**	3	Red-Black Burnished bowl
285	VIB1	//	Red-black fine mineral paste	**C1**	3	Red-Black Burnished bowl
297	VIB1	//	Red-black fine mineral paste	**A1**	1	Red-Black Burnished jar
305	VIB1	//	Red-black fine mineral paste	**E1**	5	Red-Black Burnished jar
306	VIB1	//	Red-black fine mineral paste	**D1**	4	Red-Black Burnished bowl

261	VIB1	**Red-Black semi-fine**	Red-black fine mineral paste	**C1**	3	Red-Black Burnished bowl
264	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Red-Black Burnished jar

268	VIB1	//	Red-black fine mineral paste	**D1**	4	Red-Black Burnished Small/Medium jar
275	VIB1	//	Red-black fine mineral paste	**E1**	5	Red-Black Burnished bowl (red-slipped externally)
279	VIB1	//	Monochrome fine paste with mineral	**A1**	1	Red-Black Burnished bowl
281	VIB1	//	Red-black fine mineral paste	**D1**	4	Red-Black Burnished bowl
287	VIB1	//	Brown fine paste with mineral	**E1**	5	Brown medium jar
289	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Red-Black Burnished bowl
295	VIB1	//	Red-black fine mineral paste	**C1**	3	Red-Black Burnished jar
296	VIB1	//	Red-black fine mineral paste	**D1**	4	Red-Black Burnished Small/Medium jar
300	VIB1	//	Red-black fine mineral paste	**C1**	3	Red-Black Burnished bowl
301	VIB1	//	Red-black fine mineral paste	**C1**	3	Red-Black Burnished bowl
307	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**C1**	3	Red-Black Burnished bowl
236	VIB1	**Red-Black coarse**	Subclass plain simple with fine paste	**B1**	2	Red-Black Burnished small jar
238	VIB1	//	Subclass plain simple with fine paste	**A1**	1	Red-Black Burnished bowl

259	VIB1	//	Red-Black class	**B1**	2	Red-Black Burnished large jar
260	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Red-Black Burnished Medium/Large jar

262	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Medium jar/Cooking pot??
263	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Undetermined
266	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**C1**	3	Red-Black Burnished bowl
267	VIB1	//	Red-black fine mineral paste	**C1**	3	Red-Black Burnished bowl
269	VIB1	//	Monochrome fine paste with mineral	**D1**	4	Undetermined
270	VIB1	//	Monochrome fine paste with mineral	**D1**	4	Undeternined
276	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Cooking pot??
277	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Red-Black Burnished Medium jar
278	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**A1**	1	Undetermined
283	VIB1	//	Red-black coarse mineral & organic	**C1**	3	Red-Black Burnished Medium jar

			paste, reduced internally or externally			
290	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**B1**	2	Red-Black Burnished Small jar
291	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**B1**	2	Undetermined
292	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Red-Black Burnished Large jar
293	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**B1**	2	Red-Black Burnished bowl
298	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Red-Black Burnished Large jar
299	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**D1**	4	Red-Black Burnished Large jar
294	VIB1	**Monochrome fine**	Monochrome fine paste with mineral	**C1**	3	Monochrome Burnished bowl
303	VIB1	//	Red-black fine mineral paste	**D1**	4	Red-Black Burnished bowl
304	VIB1	//	Red-black fine mineral paste	**A1**	1	Monochrome Burnished Bowl
271	VIB1	**Monochrome semi-fine**	Monochrome paste with mineral & decoration	**C1**	3	Monochrome Burnished Incised Pot Stand
280	VIB1	//	Monochrome paste with mineral	**C1**	3	Monochrome Burnished Bowl
180	VIB1	**Monochrome coarse**	Plain simple class? (VIA)	**A1**	1	Anomaly

258	VIB1	//	Monochrome paste with mineral	**D1**	4	Monochrome Burnished Medium jar
265	VIB1	//	Red-black coarse mineral & organic paste, reduced internally or externally	**C1**	3	Red-Black Burnished Medium jar
309	VIB2	**Light-Pale colored fine**	Subclass plain simple reserved complex slip	**A2**	1	Reserved-slip small jar
311	VIB2	//	Subclass plain simple reserved simple slip	**A2**	1	Reserved-slip small necked jar
313	VIB2	//	Subclass plain simple reserved simple slip	**A2**	1	Reserved-slip medium necked jar
318	VIB2	//	Subclass plain simple reserved simple slip	**A2**	1	Reserved-slip medium necked jar
320	VIB2	//	Subclass plain simple reserved complex slip	**A2**	1	Reserved-slip bowl
321	VIB2	//	Subclass plain simple reserved simple slip	**C2**	3	Undetermined
322	VIB2	//	Plain simple turned fine grit temp.	**C2**	3	Medium necked jar
323	VIB2	//	Plain simple turned fine grit temp.	**C2**	3	Small necked jar
324	VIB2	//	Red slip ware (red engobed)	**C2**	3	Red-slip high-stemmed fruit stand
325	VIB2	//	Plain simple turned fine grit temp.	**C2**	3	Light-colored bowl
326	VIB2	//	Red slip ware (red engobed)	**A2**	1	Red-slip high-stemmed fruit stand

327	VIB2	//	Plain simple turned fine grit temp.	**A2**	1	Medium necked jar
328	VIB2	//	Plain simple turned fine grit temp.	**C2**	3	Small necked jar
329	VIB2	//	Plain simple turned fine grit temp.	**A2**	1	Small necked jar??
330	VIB2	//	Plain simple turned fine grit temp.	**C2**	3	Foot of goblet
331	VIB2	//	Plain simple turned fine grit temp.	**C2**	3	Small necked jar
332	VIB2	//	Plain simple turned fine grit temp.	**C2**	3	Small necked jar
333	VIB2	//	Plain simple turned fine grit temp.	**C2**	3	Small necked jar
334	VIB2	//	Plain simple turned fine grit temp.	**A2**	1	Footed goblet??
335	VIB2	//	Plain simple turned fine grit temp.	**A2**	1	Spouted jar with perforated lags
336	VIB2	//	Plain simple turned fine grit temp.	**A2**	1	Medium necked jar??
337	VIB2	//	Plain simple reserved simple slip	**A2**	1	Reserved-slip bowl
339	VIB2	//	Red slip ware (red engobed)	**B2**	2	Red-slip high-stemmed fruit stand
308	VIB2	**Light to Pale semi-fine**	Subclass plain simple reserved complex slip	**B2**	2	Reserved-slip medium necked jar
310	VIB2	//	Subclass plain simple reserved simple slip	**A2**	1	Reserved-slip large necked jar
312	VIB2	//	Subclass plain simple reserved simple slip	**B2**	2	Reserved-slip large necked jar
314	VIB2	//	Subclass plain simple reserved simple	**A2**	1	Reserved-slip small necked jar

			slip			
315	VIB2	//	Subclass plain simple reserved simple slip	**A2**	1	Reserved-slip medium necked jar
316	VIB2	//	Subclass plain simple reserved simple slip	**A2**	1	Reserved-slip bowl
317	VIB2	//	Subclass plain simple reserved complex slip	**B2**	2	Reserved-slip large necked jar
319	VIB2	//	Subclass plain simple reserved complex slip	**A2**	1	Undetermined
338	VIB2	//	Kitchen class 1-pots	**A2**	1	Undetermined

??: Not definite

Table 12: Groupings of Paste Types

Paste Type	**Paste Grouping**	**Description**
A, A1, A2	Group 1	Fine to semi-fine pastes, lithic and mineral only
B, B1	Group 2	Coarse pastes, lithic and mineral only
B2, C, C1	Group 3	Fine to semi-fine pastes, chaff+lithic+mineral
D, D1	Group 4	Coarse pastes, chaff+lithic+mineral
E, E1, C2	Group 5	Very fine gritty pastes

Fig. 2a: Period VIA Wheel-made Mass-produced Bowls. (Photo: Frangipane, M.)

Fig. 2b: Period VIA Wheel-madeJars (Photo: Frangipane, M.)

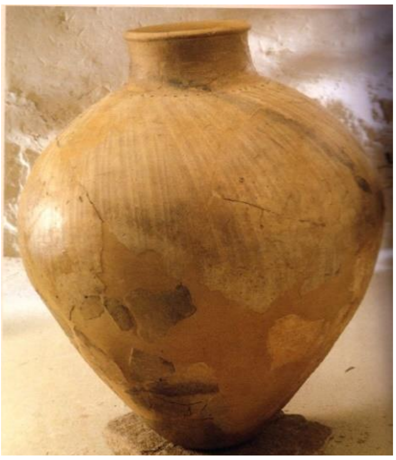


Fig. 2c: Period VIA Reserved-slip Large Jar (Photo: Frangipane, M.)

Fig. 2d: Period VIA Hand-made Red-Black Burnished Handled Bowl (Photo: Frangipane, M.)

Fig. 2e: Period VIA Hand-made Black Burnished Small Serving Jar (Photo: Frangipane, M.)

Fig. 3a: Period VIB1 Hand-made Red-Black Burnished Two-handled Jar (Photo: Frangipane,

Fig. 3b: Period VIB1 Hand-made Red-Black Burnished Small Jars (Photo: Frangipane, M.)

Fig. 3c: Period VIB1 Hand-made Red-Black Burnished Bowl (Photo: Frangipane, M.)

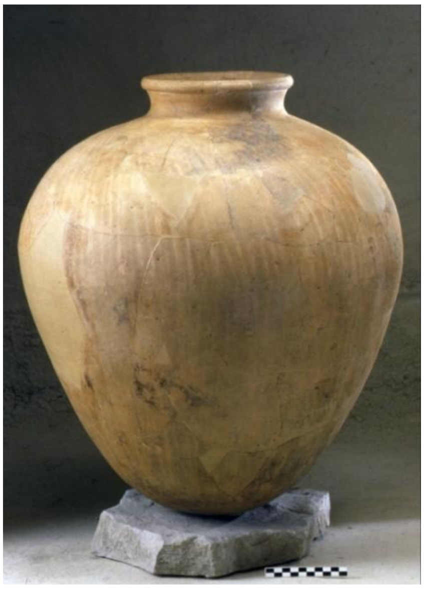


Fig. 4a: Period VIB2 Reserved-slip Large Jar (Photo: Frangipane, M.)

Fig. 4b: Period VIB2 Reserved-slip Medium Jar (Photo: Frangipane, M.)

Fig. 4c: Period VIB2 Kitchen Pots(Photo: Frangipane, M.)

Fig. 4d: Period VIB2 Goblet (Photo: Frangipane, M.)

Fig. 4e: Period VIB2 Light-colored Bowl (Photo: Frangipane, M.)

Fig. 4f: Period VIB2 Reserved-slip Bowl (Photo: Frangipane, M.)

Fig. 4g: Period VIB2 Red-slipped High-stemmed Bowl (Photo: Frangipane, M.)

Fig. 4h: Period VIB2 wheel-made Vessels (Photo: Frangipane, M.)

Images of Period VIA Shards and Pastes

Fig5a-c: Some self-slipped shards from Period VIA

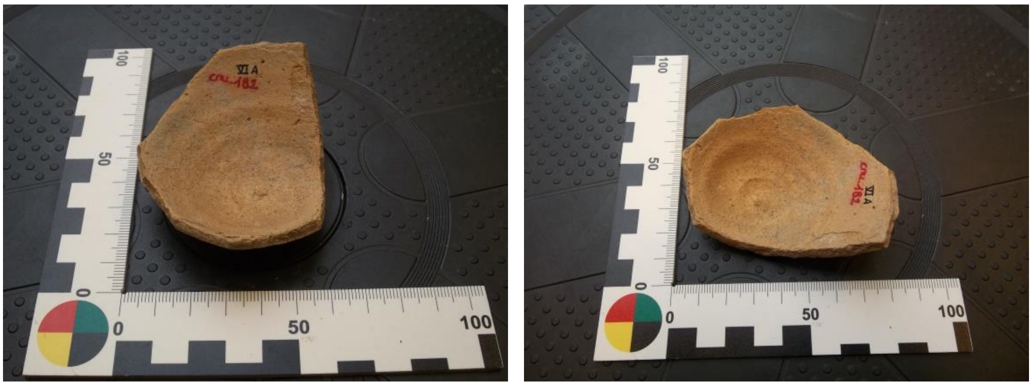


Fig5d: Wheel-made shard from Period VIA

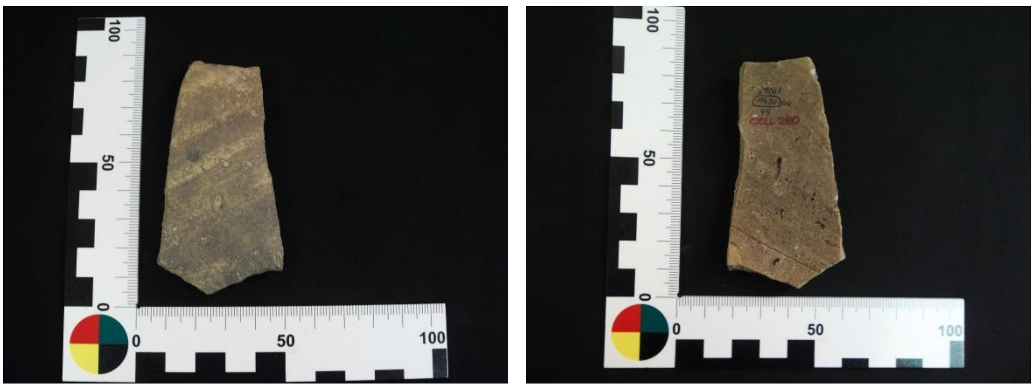


Fig.6a: External + Internal pale colored Reserved-slip shard from Period VIA

Fig.6b: External + Internal light colored Reserved-slip shard from Period VIA

Fig.6c: External + Internal buff colored Reserved-slip shard from Period VIA

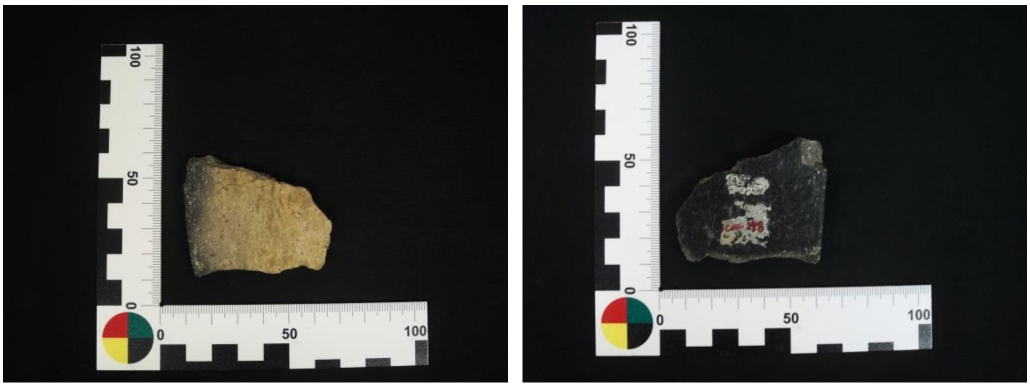


Fig.6d: External + Internal Red-Black Burnished shard from Period VIA

Fig.6e: External + Internal of Plain light-colored shard from Period VIA

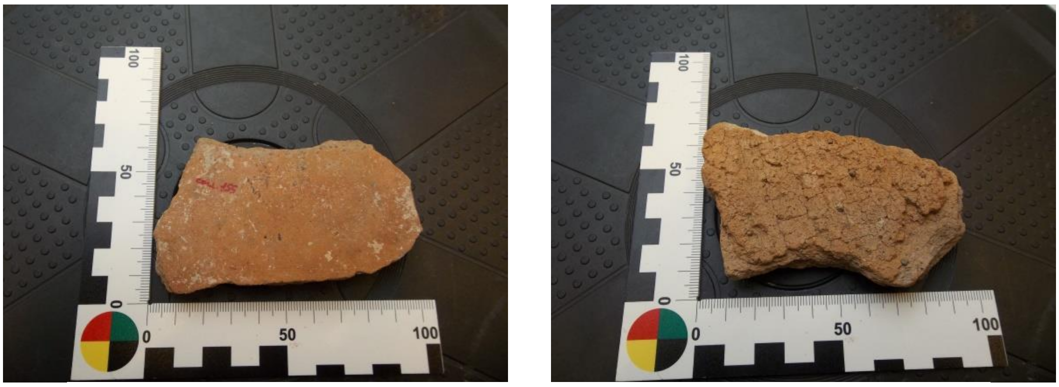


Fig.6f: External + Internal of hand-made light-colored shard from Period VIA

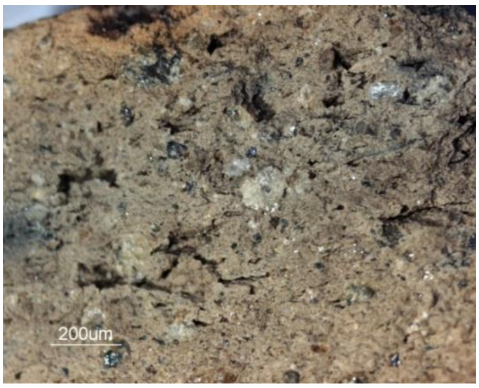


Fig. 7a: Medium texture paste with micro-cavities + quartz and schist inclusions belonging to Paste A

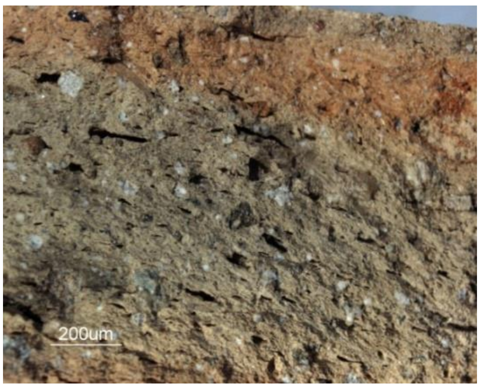


Fig. 7b: Fine texture paste with micro-cavities + homogeneously dispersed quartz inclusions belonging to Paste A. Shard fragment shows a light gray core

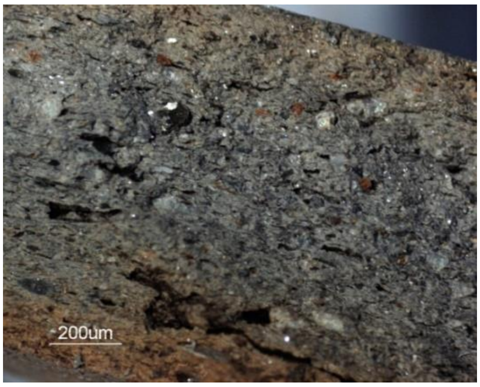


Fig.7c: Fine texture paste with micro-cavities + specs of mica belonging to Paste A. Shard fragment shows a gray core

Fig.7d: Fine texture paste belonging to Paste A. Shard fragment shows a brownish-buff core.

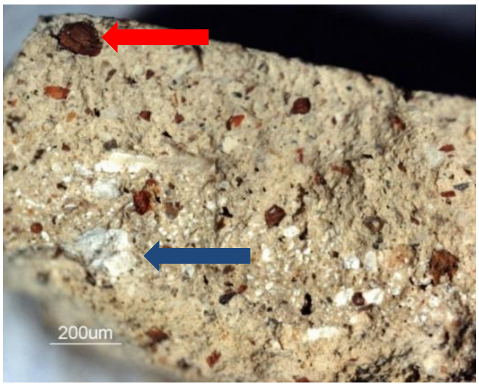


Fig.7e: Fine texture paste with medium-sized grit 1 and quartz inclusions clustered in the paste. Paste belongs to Paste A. (Red arrow shows grit 1 and blue arrow shows quartz inclusions).

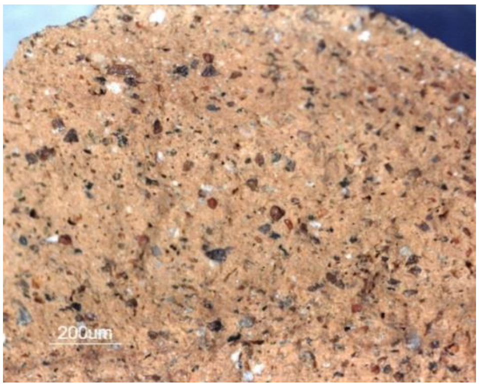


Fig.7f: Fine texture paste with fine sized grit 6 clustered in the paste. Paste belongs to Paste A.

Fig.7g: Shards with untreated internal surface from Period VIA

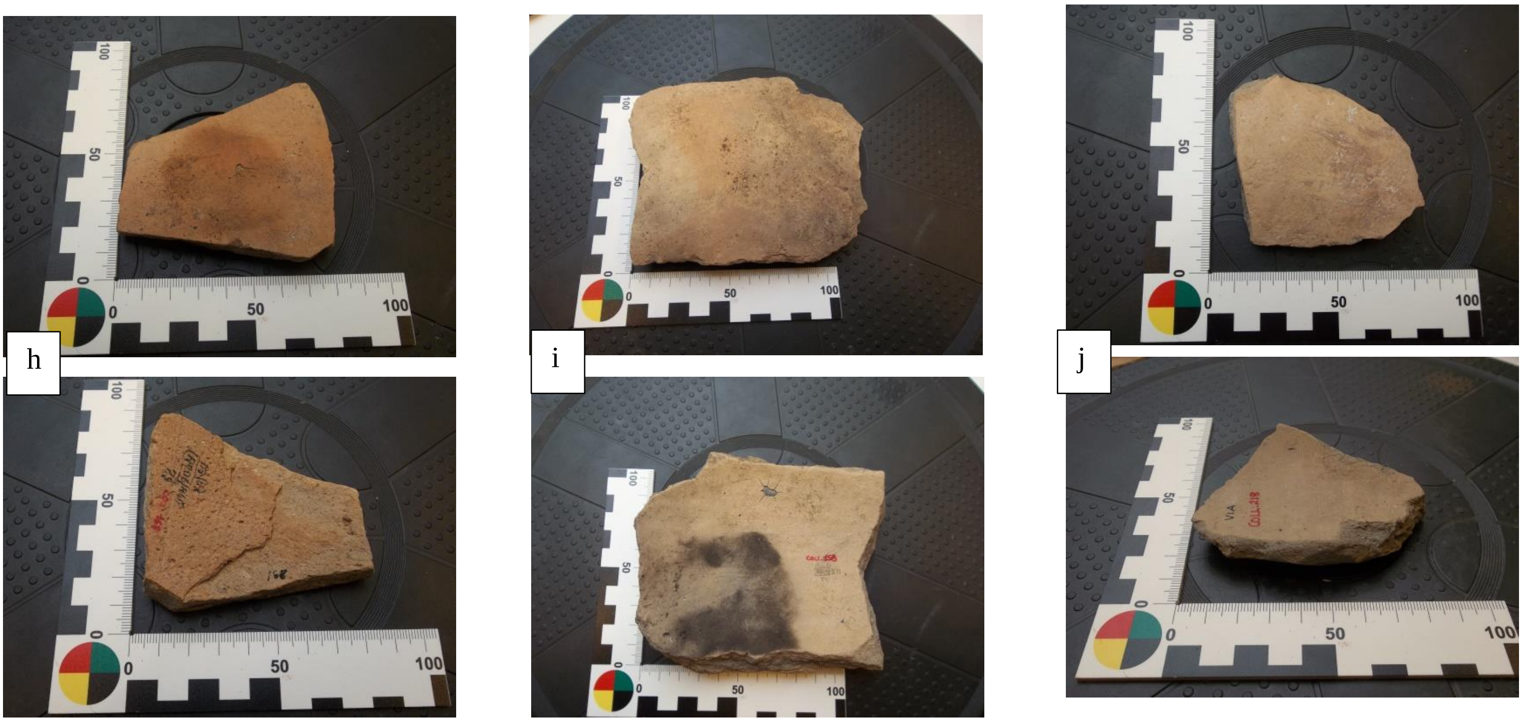


Fig.7h-j: External + Internal shards of hand-made Kitchen vessels belonging to Paste A

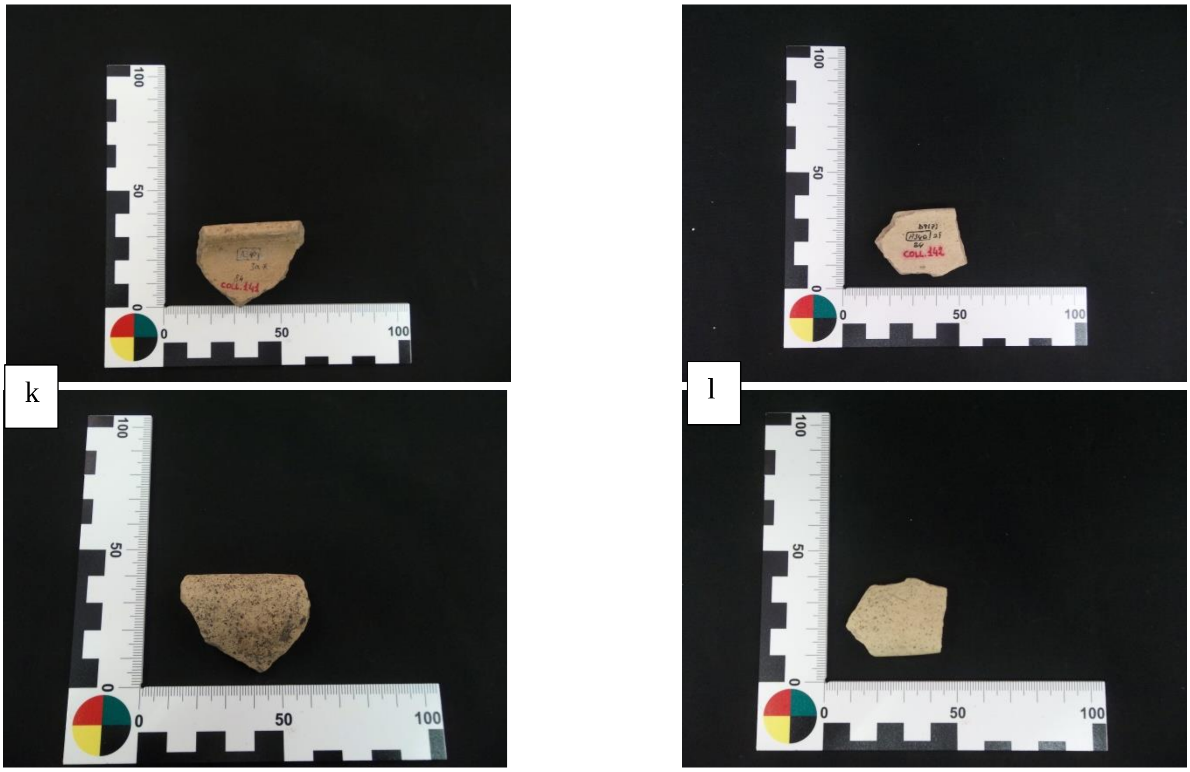


Fig.7k-l: External + Internal shards of beaked bowls belonging to Paste A

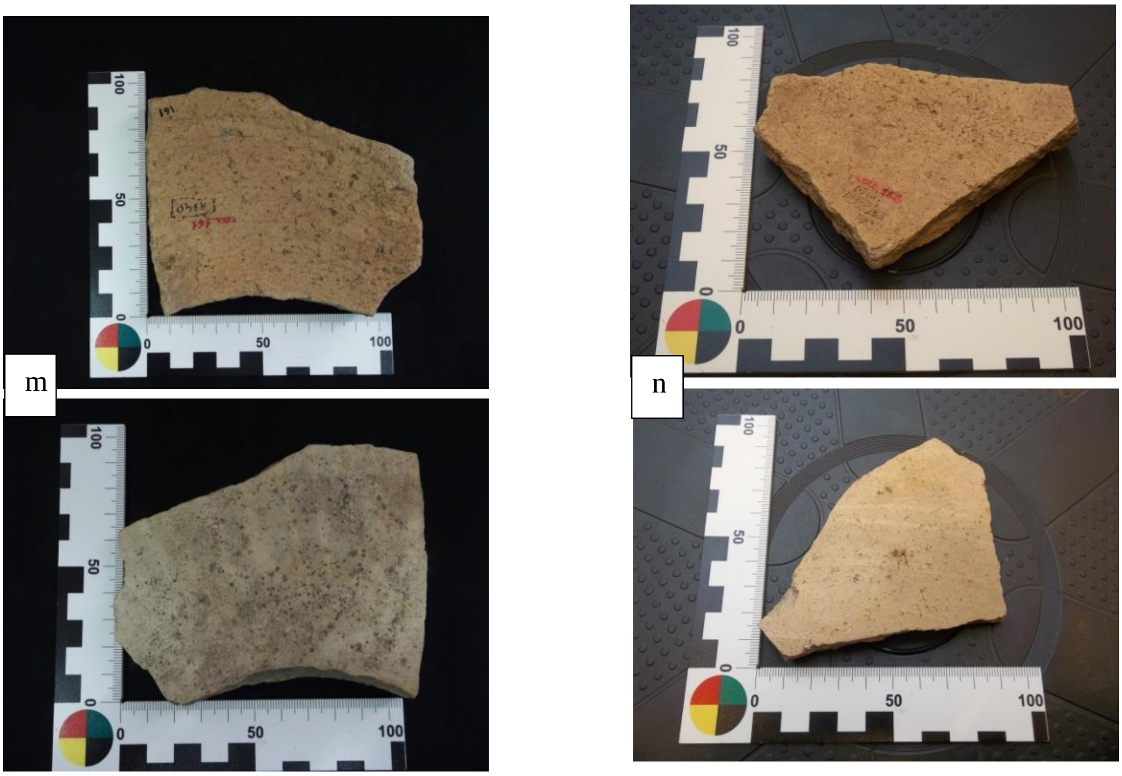


Fig.7m-n: External + Internal shards of Reserved-slip large necked jars belonging to Paste A

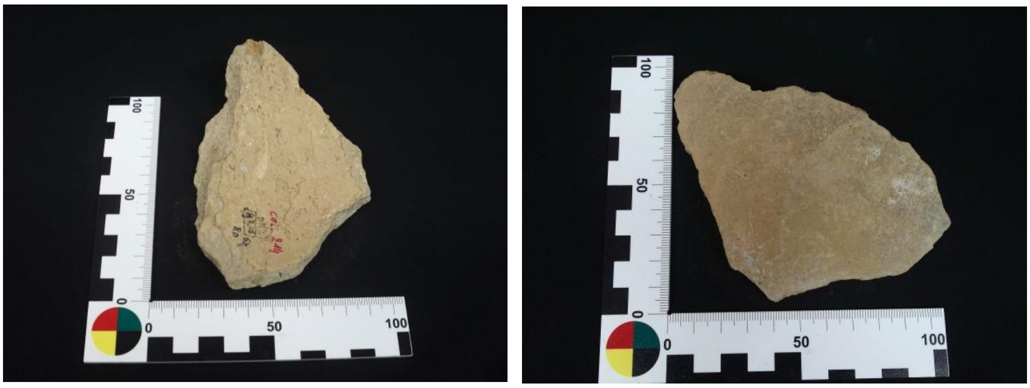


Fig.7o: External + Internal shards of large open bowl belonging to Paste A

Fig.7p: Fine texture paste with medium-sized mica and chaff inclusions. Paste belongs to Paste A.

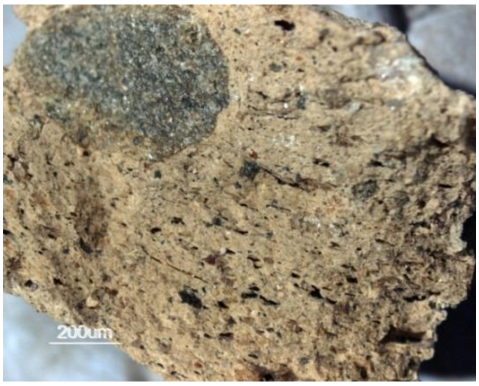


Fig.8a: Coarse texture paste with a coarse sized grit 4 inclusion. Paste belongs to Paste B.

Fig.8b: Coarse texture paste with a coarse sized grit 2 (red arrow) and quartz inclusions. Paste belongs to Paste B.

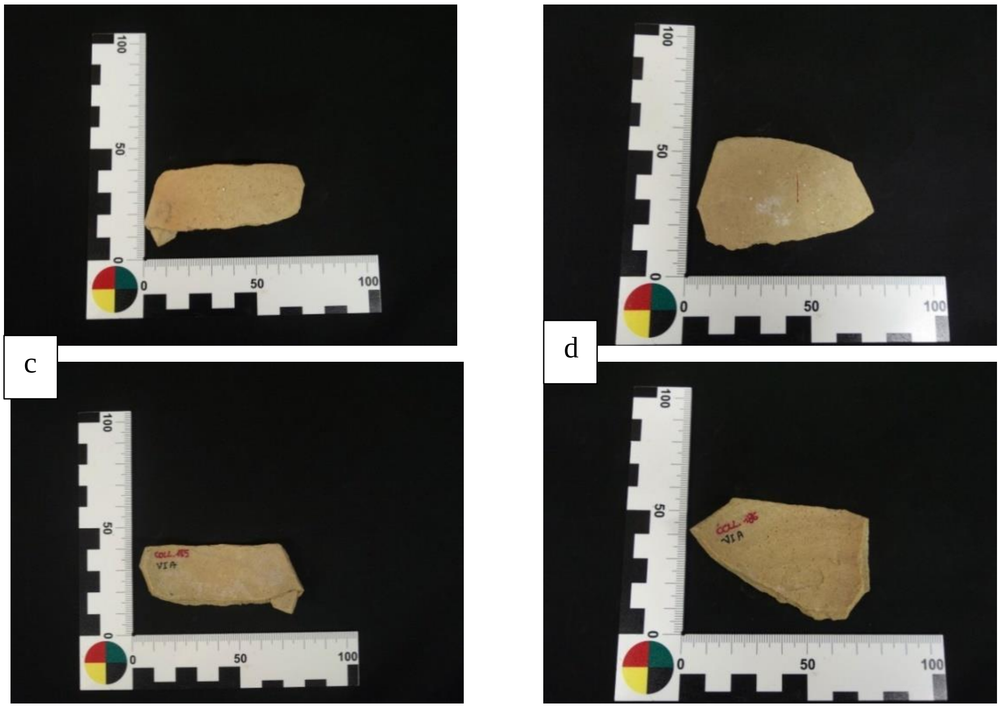


Fig.8c-d: External + Internal shards of wheel made vessels belonging to Paste B

Fig.9a: Fine texture paste with mixed inclusions. Paste belongs to Paste C.

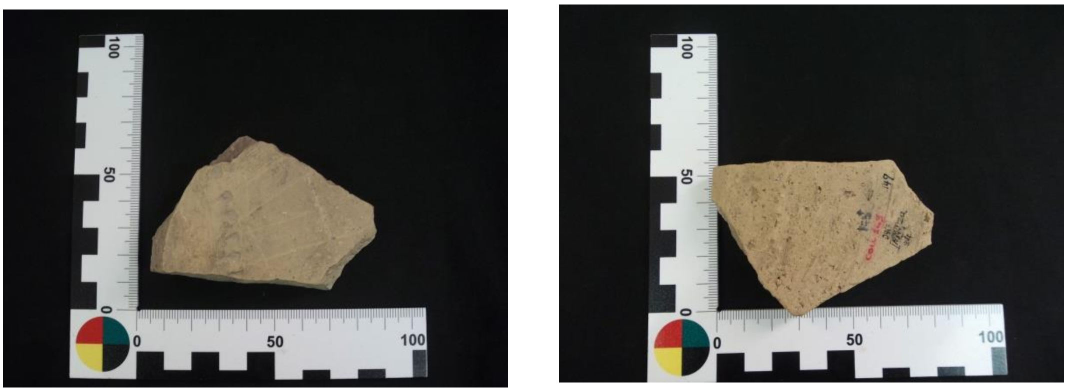


Fig.9b: External + Internal shard of decorated and Reserved-slip jar belonging to Paste C

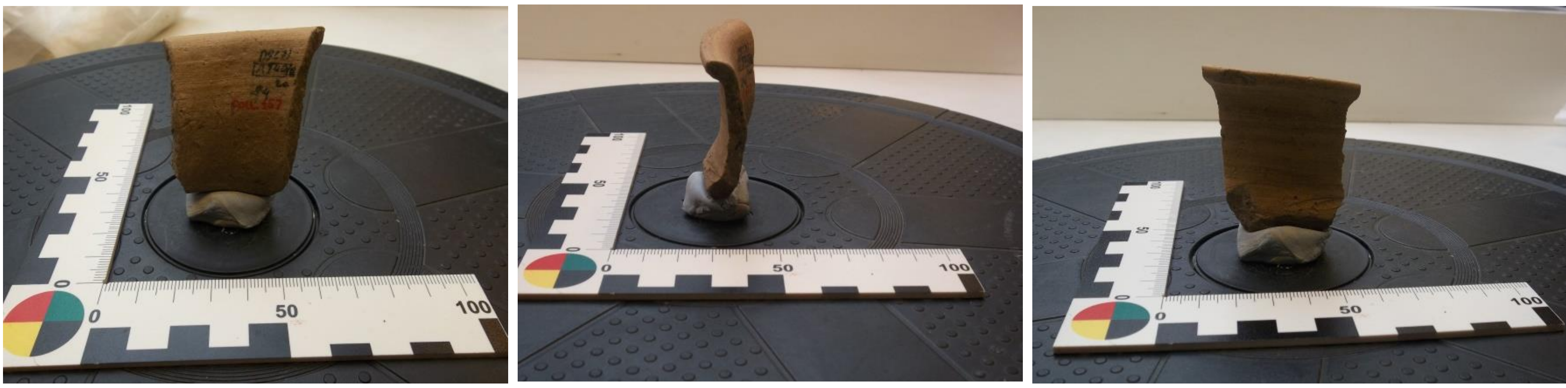


Fig.9c: External + Internal neck shard of small-sized jar belonging to Paste C

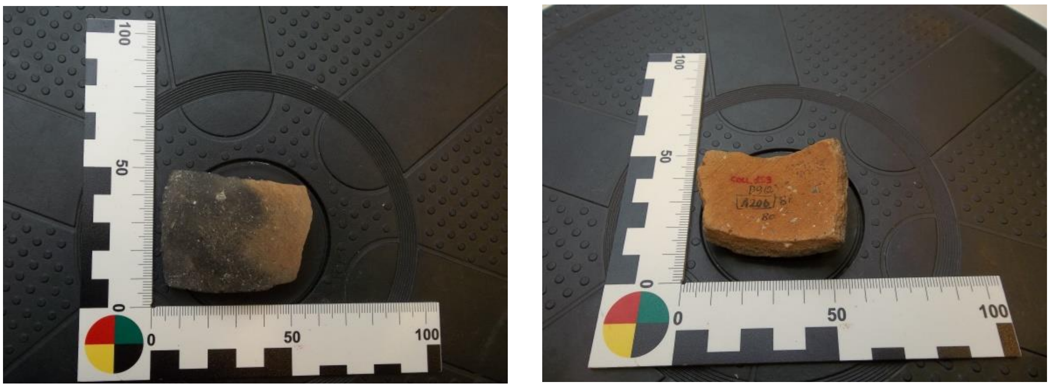


Fig.9d: External + Internal shard of Red-Black Burnished small jar belonging to Paste C

Fig.10a: Coarse texture paste with chaff inclusions and coarse sized lithic fragments. Paste belongs to Paste D.

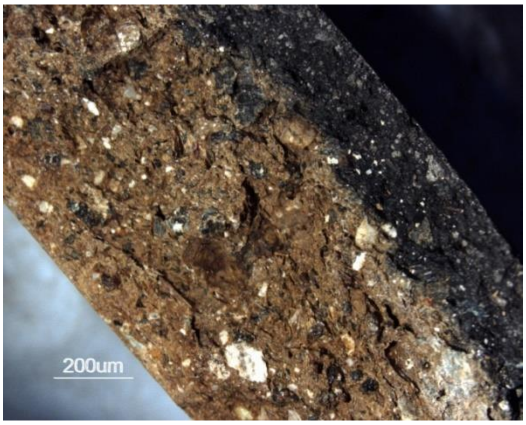


Fig.10b: Coarse texture paste with chaff inclusions and fine lithic fragments. Paste belongs to Paste D.

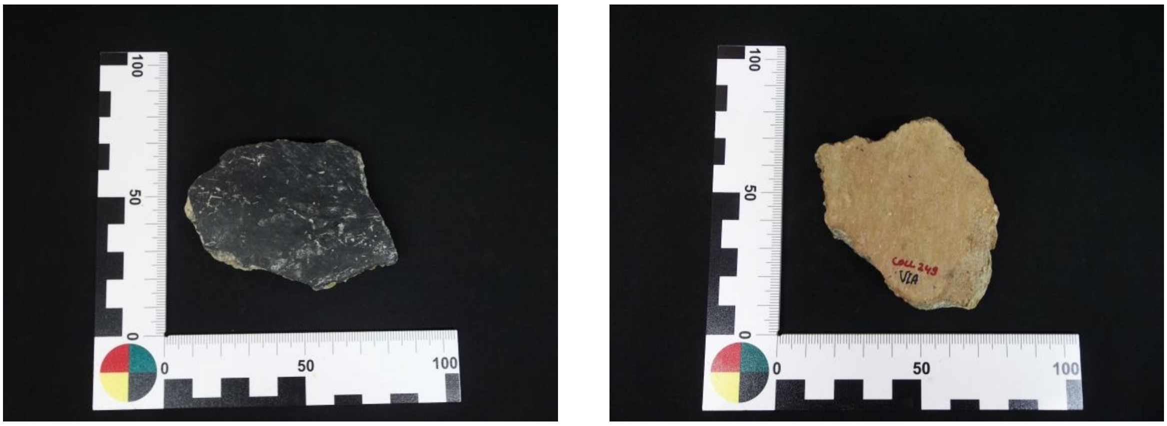


Fig.10c: External + Internal shard of Red-Black Burnished jar belonging to Paste D

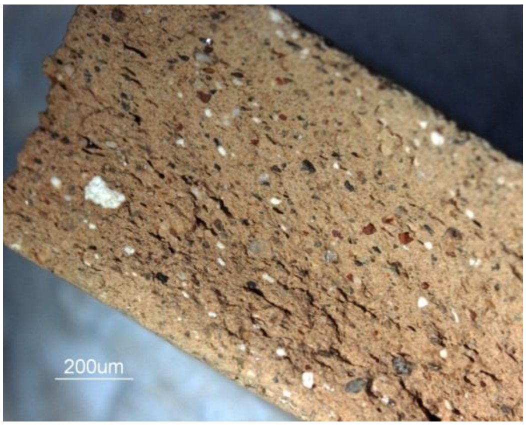


Fig.11a: Fine gritty paste with some visible quartz and grit 5 inclusions. Paste belongs to Paste E.

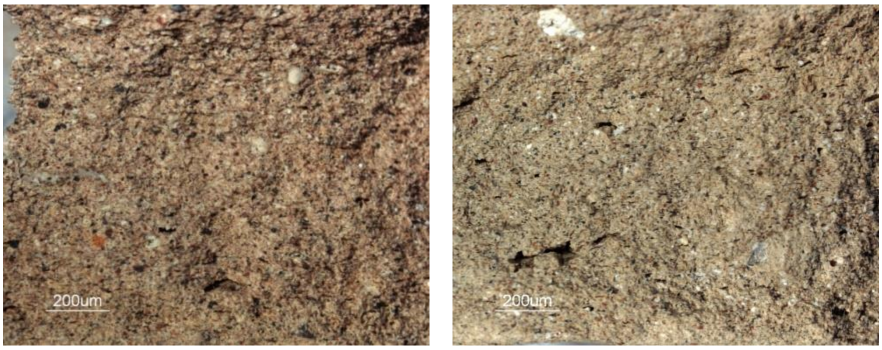


Fig.11b-c: Fine gritty pastes without any visible inclusions. Paste belongs to Paste E.

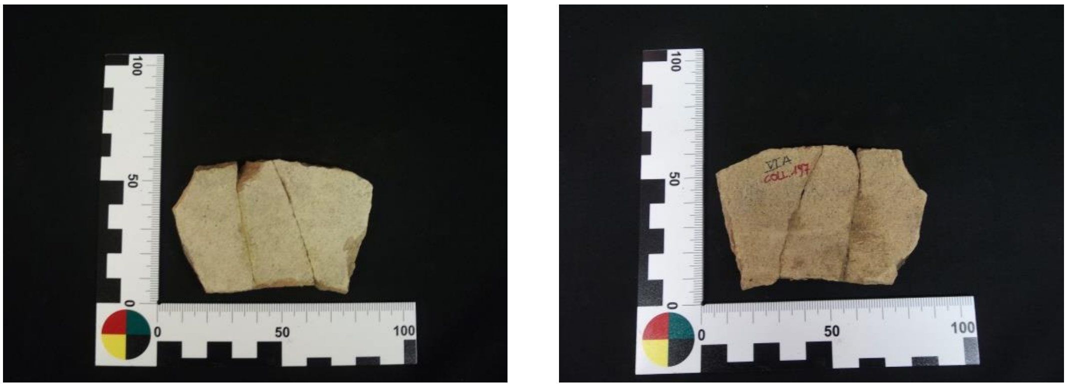


Fig.11d: External + Internal shard of a large necked jar belonging to Paste E

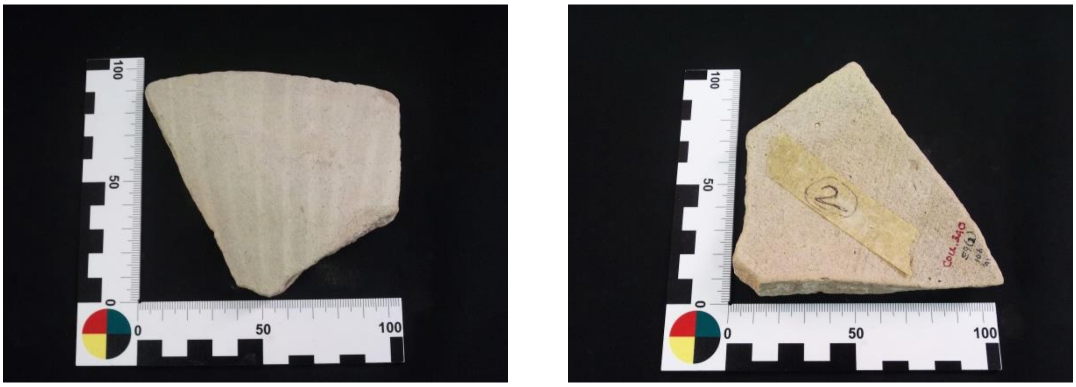


Fig.11e: External + Internal shard of light colored Reserved-slip jar belonging to Paste E

Images of Period VIB1 Shards and Pastes

Fig.12a: Fine brown paste with well-diffused inclusions. Paste belongs to Paste A1.

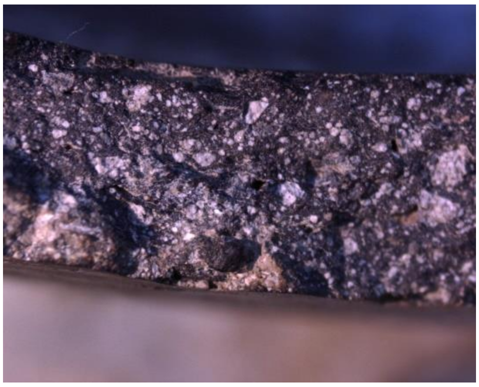


Fig.12b: Fine black paste with clustered inclusions. Paste belongs to Paste A1.

Fig.12c: Fine granular paste with clustered grit 3 inclusions. Paste belongs to Paste A1.

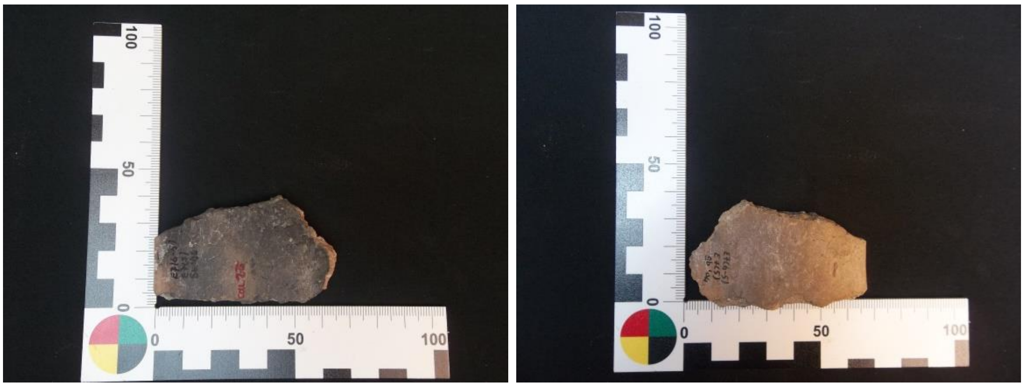


Fig.12d: External + Internal Red-Black Burnished (brown) shard associated with jars belonging to Paste A1.

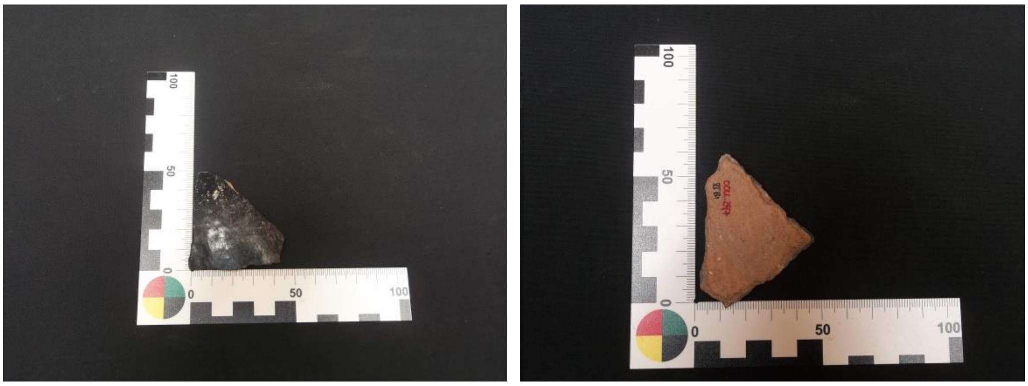


Fig.12e: External + Internal Red-Black Burnished shard associated with jars belonging to Paste A1.

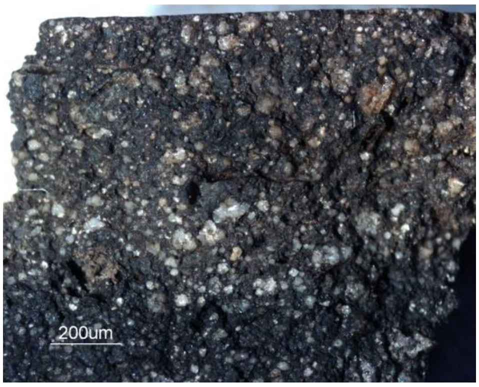


Fig.13a: Coarse texture paste with granular surface due to fine clustered inclusions. Paste belongs to Paste B1.

Fig.13b: Coarse texture paste with protruding coarse lithic inclusions. Paste belongs to Paste B1.

Fig.13c: Coarse texture paste with clustered grit 3 inclusions. Paste belongs to Paste B1.

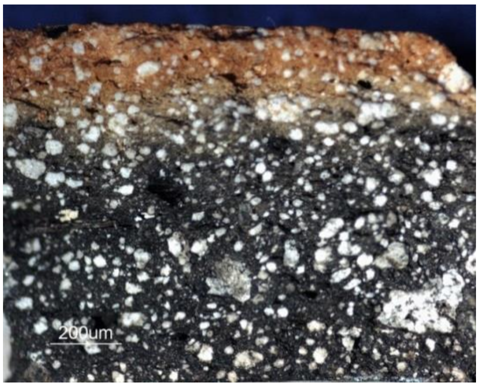


Fig.14a: Medium texture paste with fine to medium sized lithic and chaff inclusions clustered in the paste. Paste belongs to Paste C1.

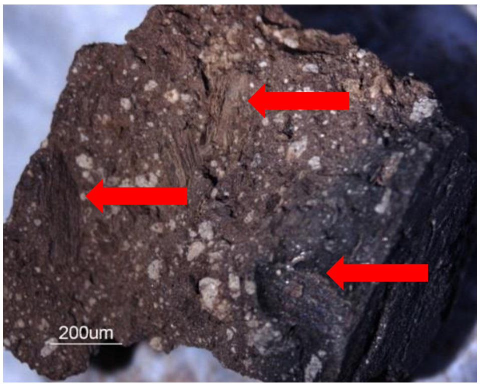


Fig.14b: Medium texture paste with medium sized lithic and chaff inclusions clustered in the paste . Paste belongs to Paste C1. (arrows show features of chaff inclusions)

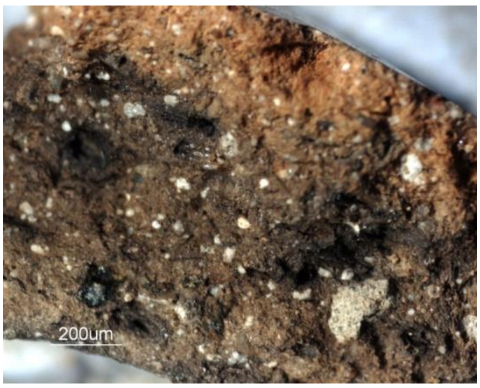


Fig.14c: Fine texture paste with fine sized lithic and burnt chaff inclusions well-dispersed in the paste. Paste belongs to Paste C1.

Fig.14d: Externally incised and dotted Monochrome shard associated with pot stand belonging to Paste C1.

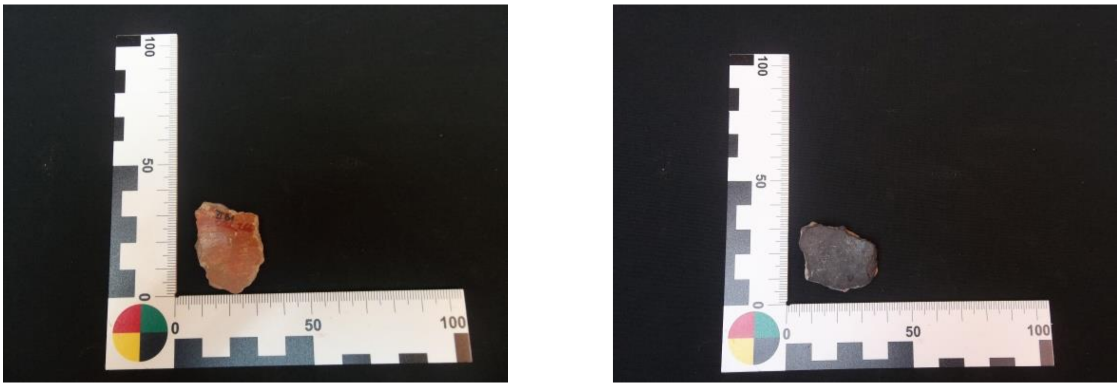


Fig.14e: External + Internal Red-Black Burnished shard with red-slip associated with bowls belonging to Paste C1.

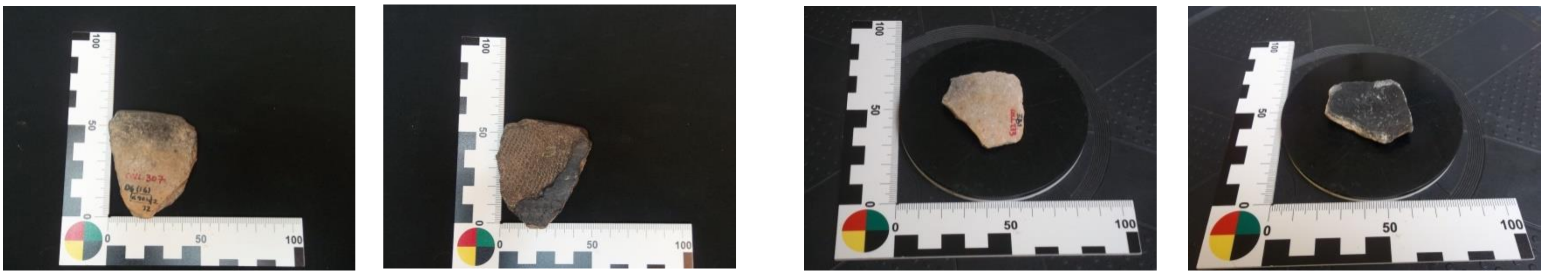


Fig.14f: External + Internal Red-Black Burnished shards associated with bowls belonging to Paste C1.

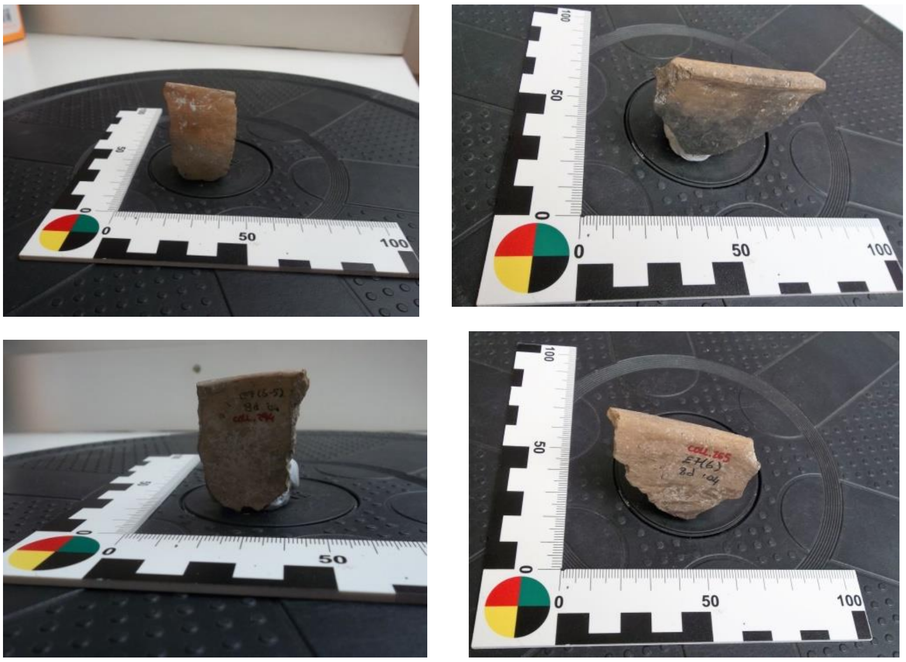


Fig.14g: External + Internal Monochrome shard associated with bowls belonging to Paste C1.

Fig.15a: Coarse texture paste with badly sorted inclusions. Paste belongs to Paste D1.

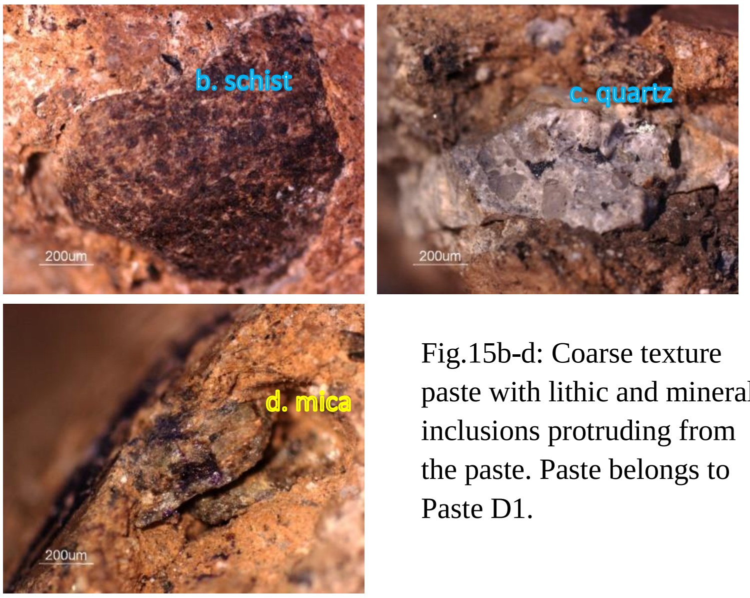


Fig.15b-d: Coarse texture paste with lithic and mineral inclusions protruding from the paste. Paste belongs to Paste D1.

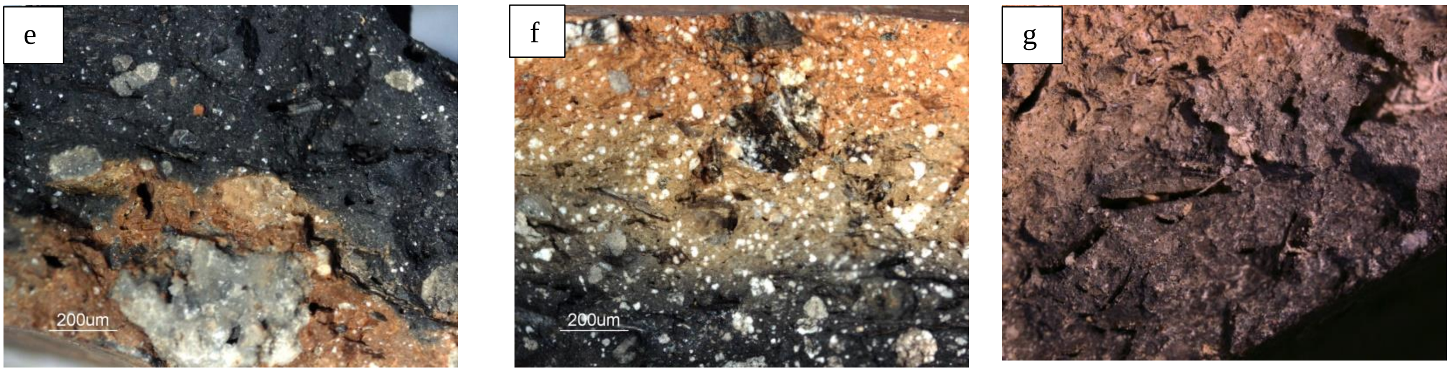


Fig.15e-g: Coarse texture clayey paste with lithic and chaff inclusions. Inclusions are babdly sorted and not well-mixed in the paste. Paste belongs to Paste D1.

Fig.15h: External + Internal Monochrome shard associated with jars belonging to Paste D1.

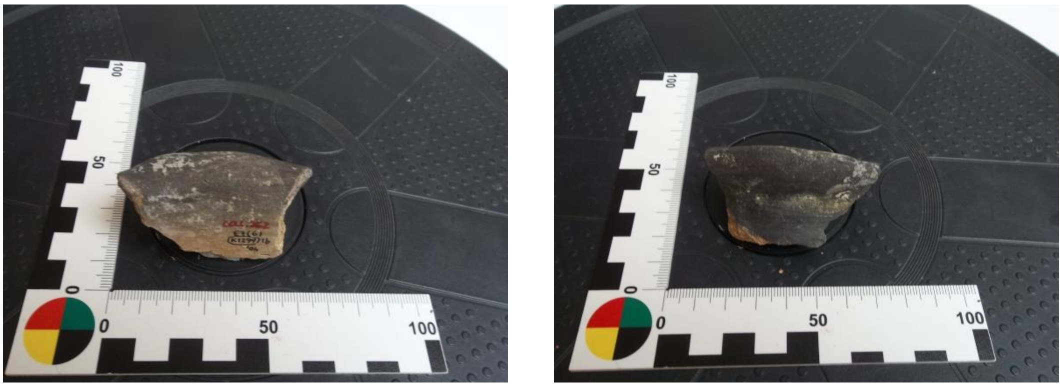


Fig.15i: External + Internal Red-Black Burnished shard associated with jars belonging to Paste D1.

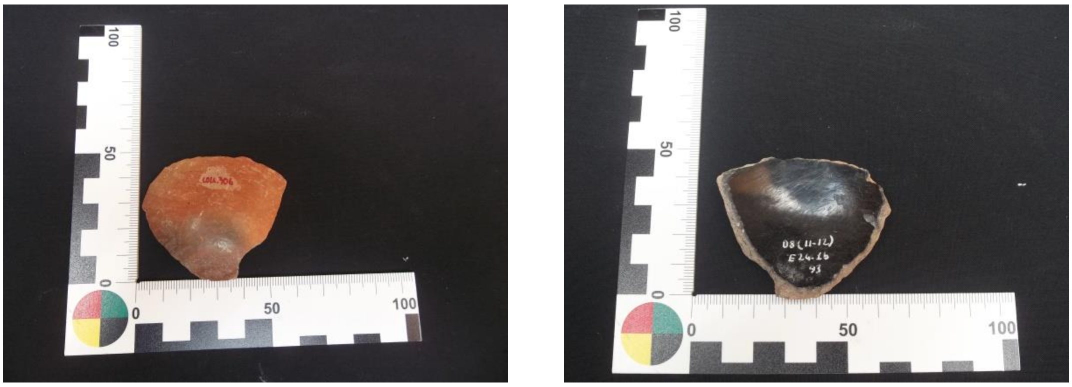


Fig.15j: External + Internal Red-Black Burnished shard associated with bowls belonging to Paste D1.

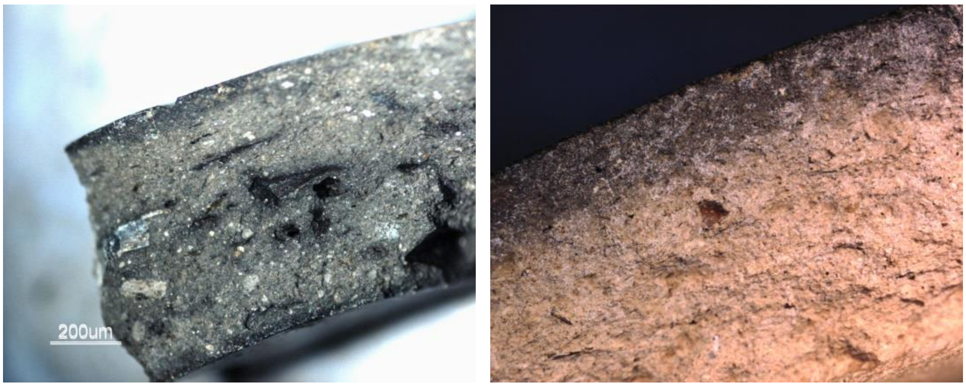


Fig.16a-b: Very fine gritty paste with macroscopically invisible inclusions. Paste belongs to Paste E1.

Fig.16c: Fine gritty paste with burnt chaff belonging to Paste E1.

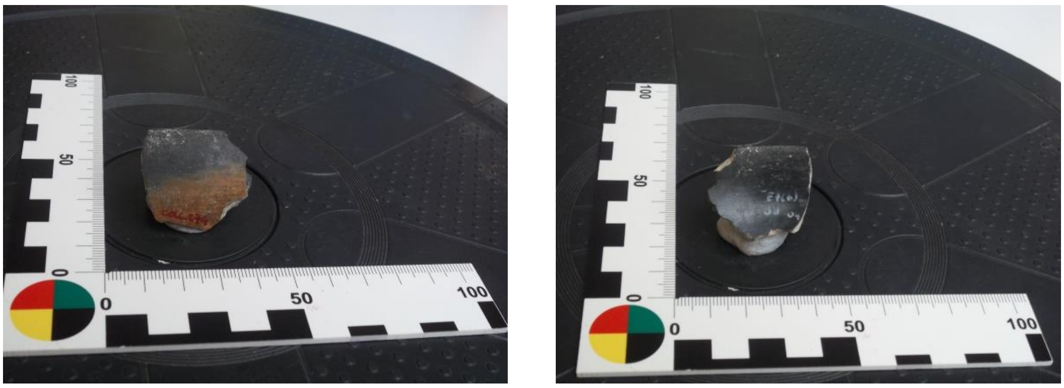


Fig.16d: External + Internal Red-Black Burnished shard associated with bowls belonging to Paste E1.

Images of Period VIB2 Shards and Pastes

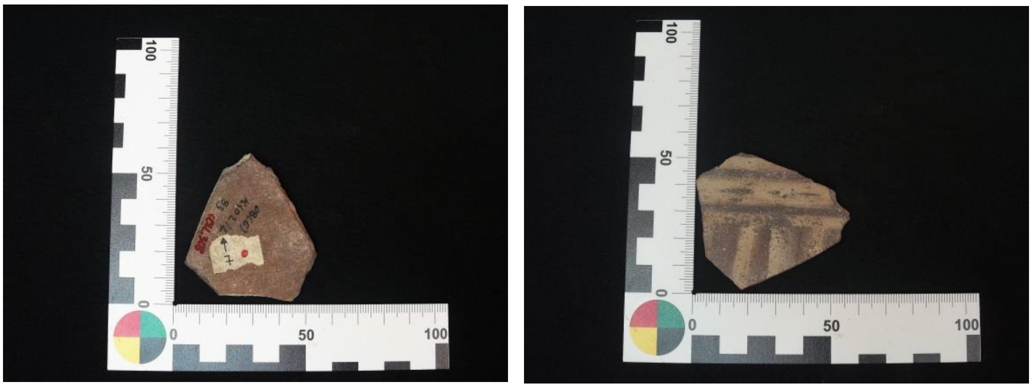


Fig.17a: External + Internal Reserved-slip shard of Period VIB2

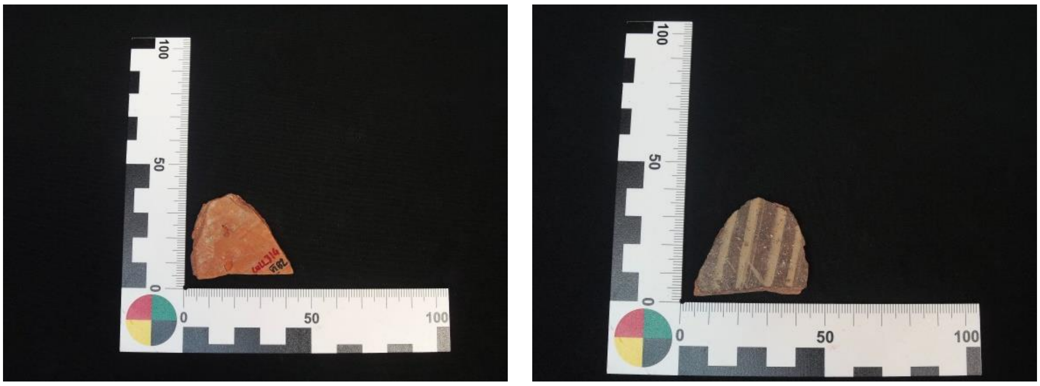


Fig.17b: External + Internal Reserved-slip shard of Period VIB2

Fig.17c: External + Internal shards of a foot of a goblet from Period VIB2

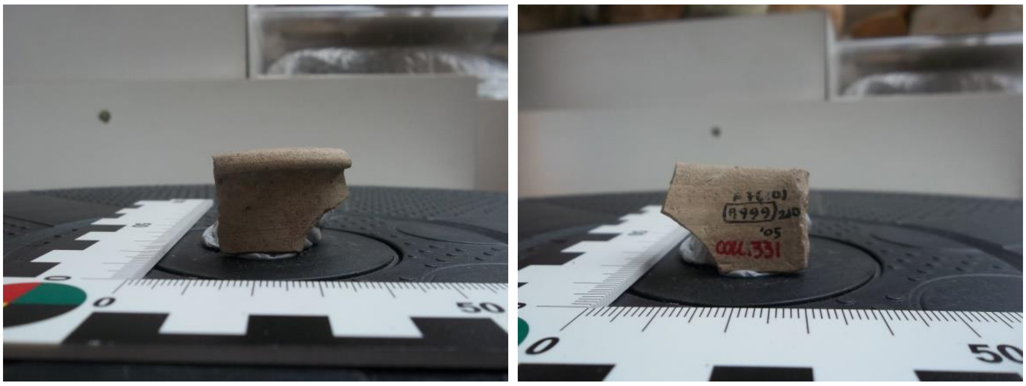


Fig.17d: External + Internal Wheel-made shards of Period VIB2

Fig.17e: External + Internal Wheel-made shards of Period VIB2 (Footed Goblet)

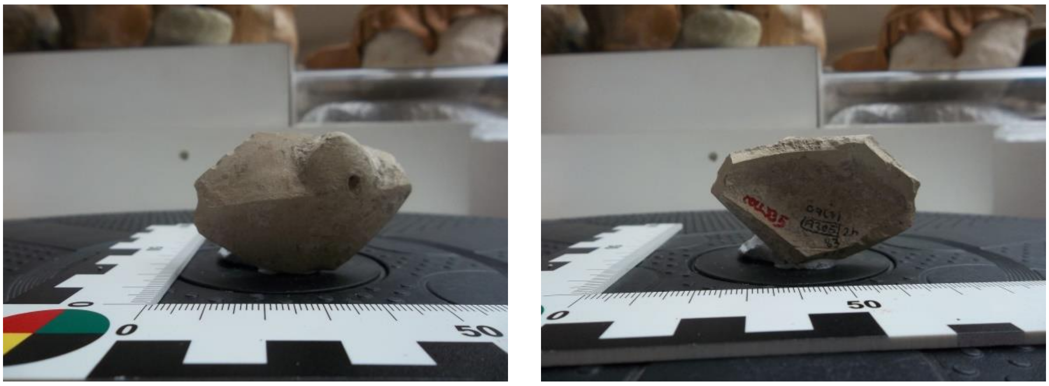


Fig.17f: External + Internal shard of spouted jar with perforated jar belonging to Period VIB2

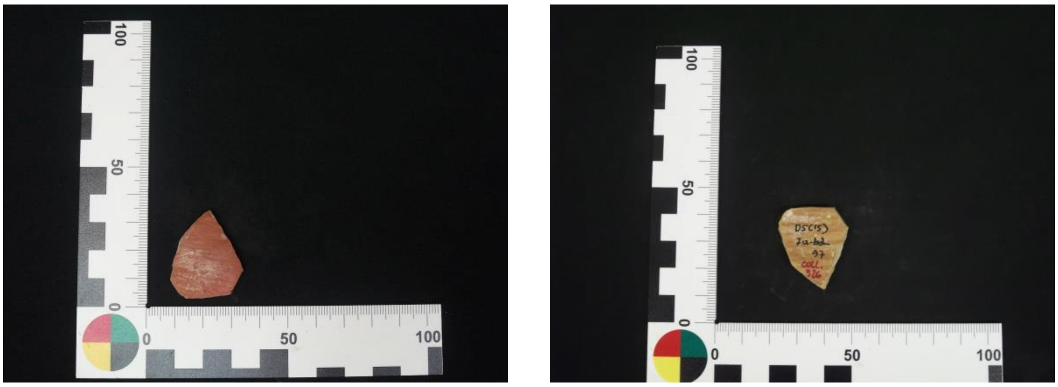


Fig.17g: External + Internal Red-slip shards of Period VIB2 (Foot of fruit stand)

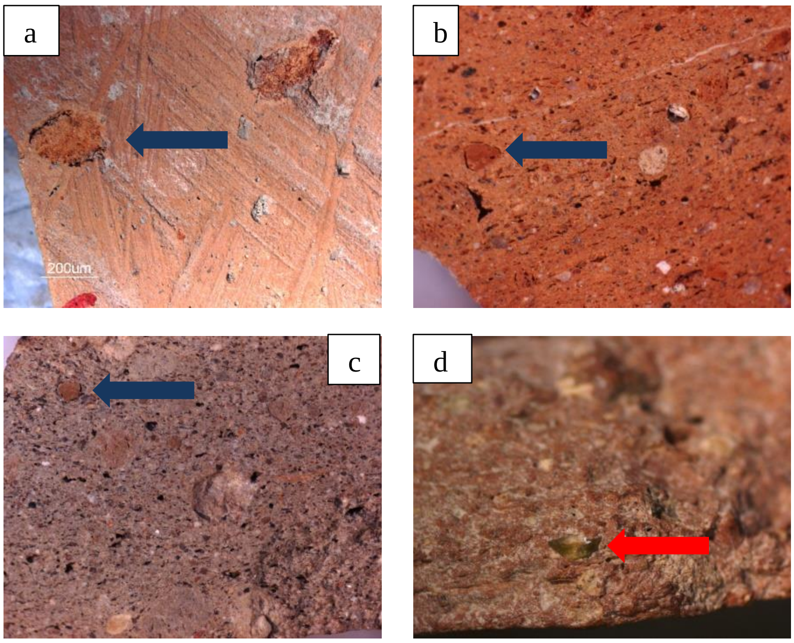


Fig.18a-d: Different color tones of fine texture mineral paste with the prevalence of grit 5 (blue arrow).

Sample 18d show a medium sized grain of grit 2 inclusions (red arrow). Pastes belong to Paste A2

Fig.18e: Fine texture mineral paste with medium sized grit 4 inclusion (see red arrow). Pastes belongs to Paste A2

Fig.18f: Fine texture mineral paste + grit 6 with gray core. Pastes belongs to Paste A2

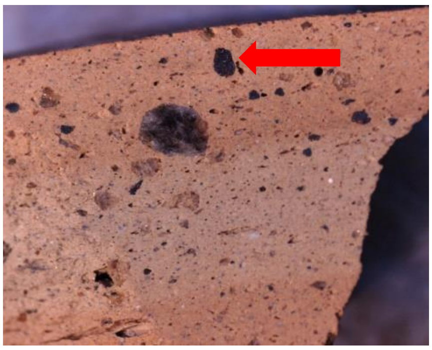


Fig.18g: Fine texture mineral paste with medium sized grit 4 and schist inclusions (schist-red arrow). Pastes shows light gray core and belongs to Paste A2

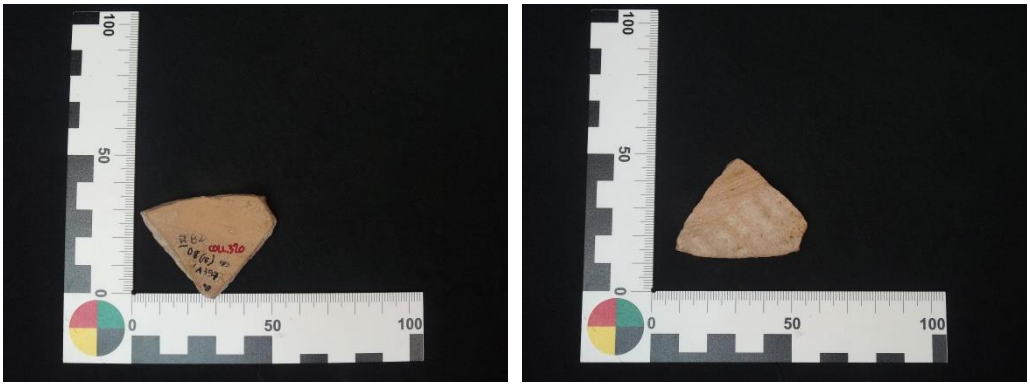


Fig.18h: External + Internal Reserved-slip shard associated with bowls belonging to Paste A2.

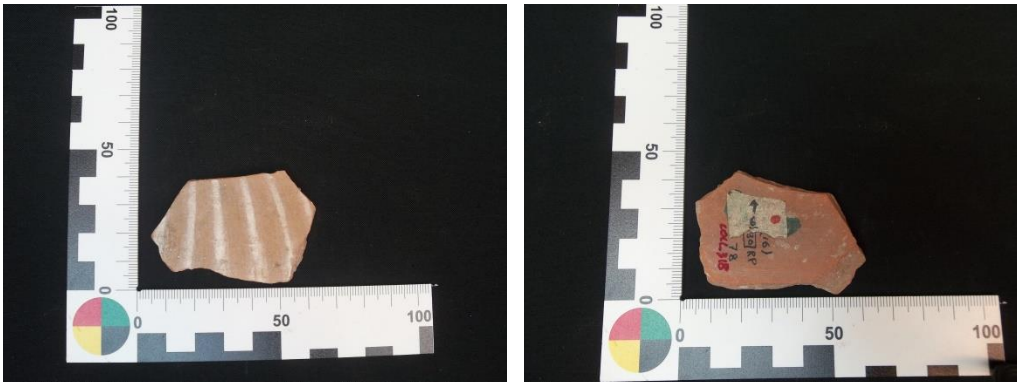


Fig.18i: External + Internal Reserved-slip shard associated with necked jars belonging to Paste A2.

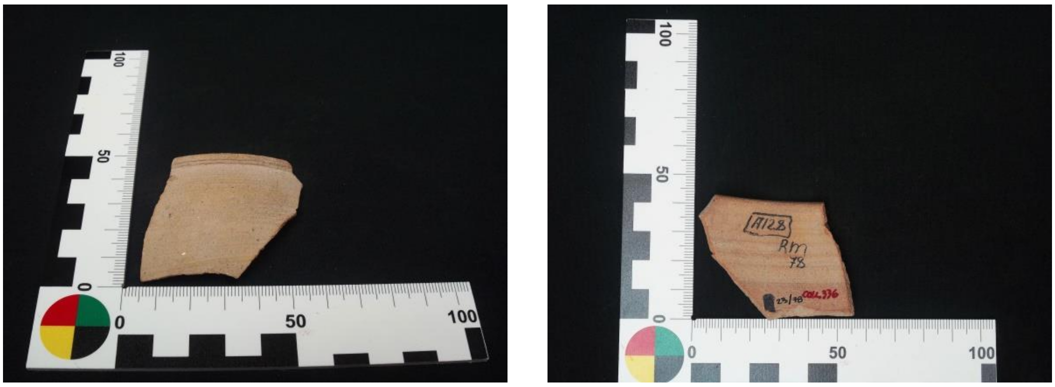


Fig.18j: External + Internal shard associated with a medium necked jar belonging to Paste A2. (not definite)

Fig.19a: Fine texture mineral paste with fine chaff and quartz inclusions. Paste belongs to Paste B2

Fig.19b: Fine texture mineral paste + fine chaff inclusions with gray core. Paste belongs to Paste B2

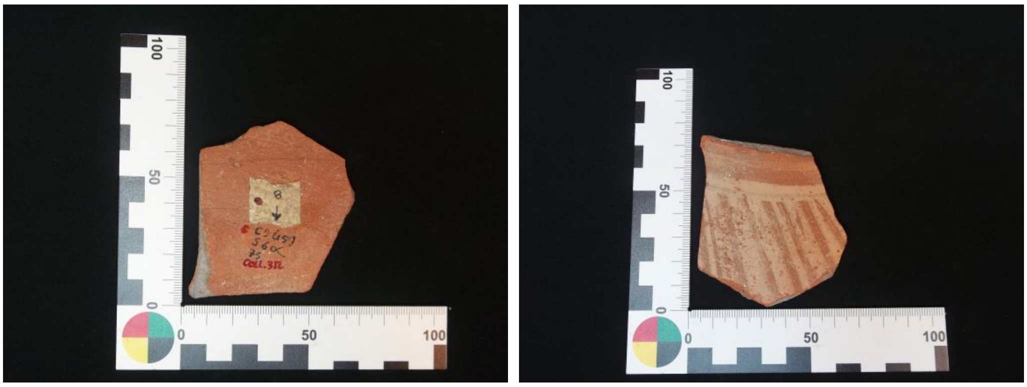


Fig.19c: External + Internal Reserved-slip shards associated with the large necked jar belonging to Paste B2.

Fig.20a-c: Different color tones of fine mineral gritty paste without any visible inclusions. Paste belongs to Paste C2.

Fig.20d-f: Different color tones of fine mineral gritty paste with visible fine inclusions. Paste belongs to Paste C2.

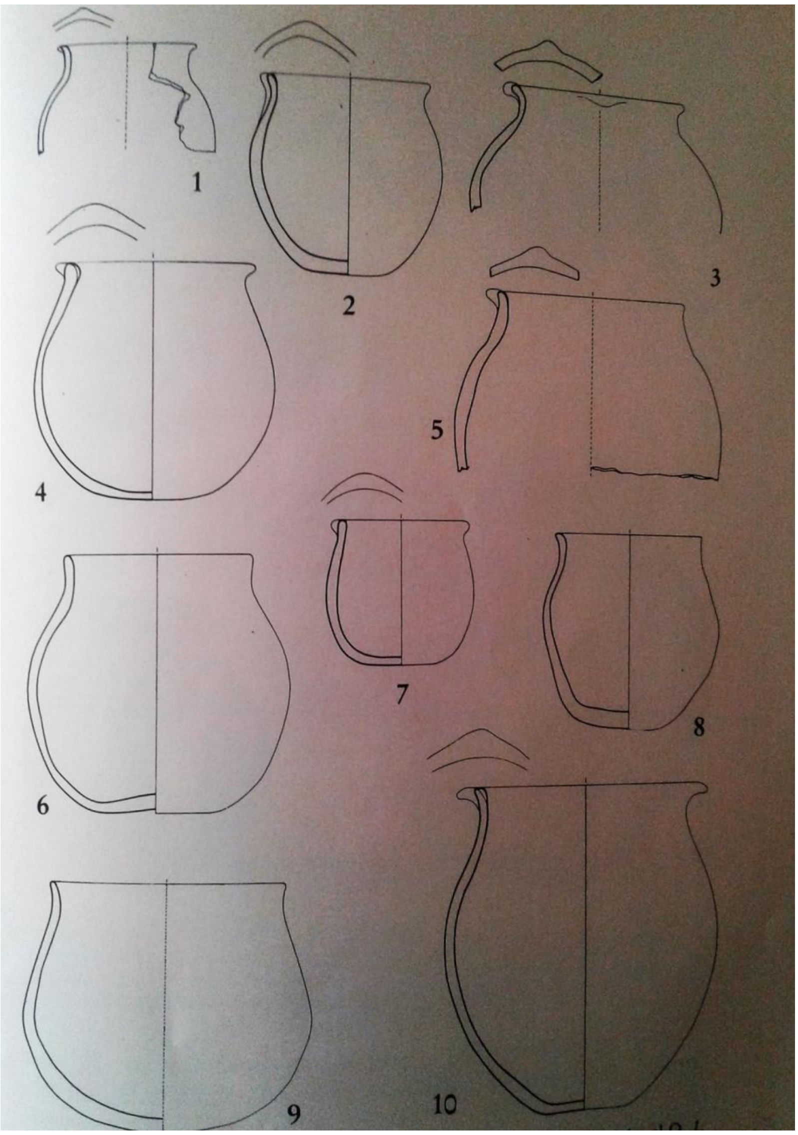


Fig.21: Profile types of kitchen vessels of Period VIB2 (Drawings from Frangipane and Palmieri, 1983: Fig. 23).

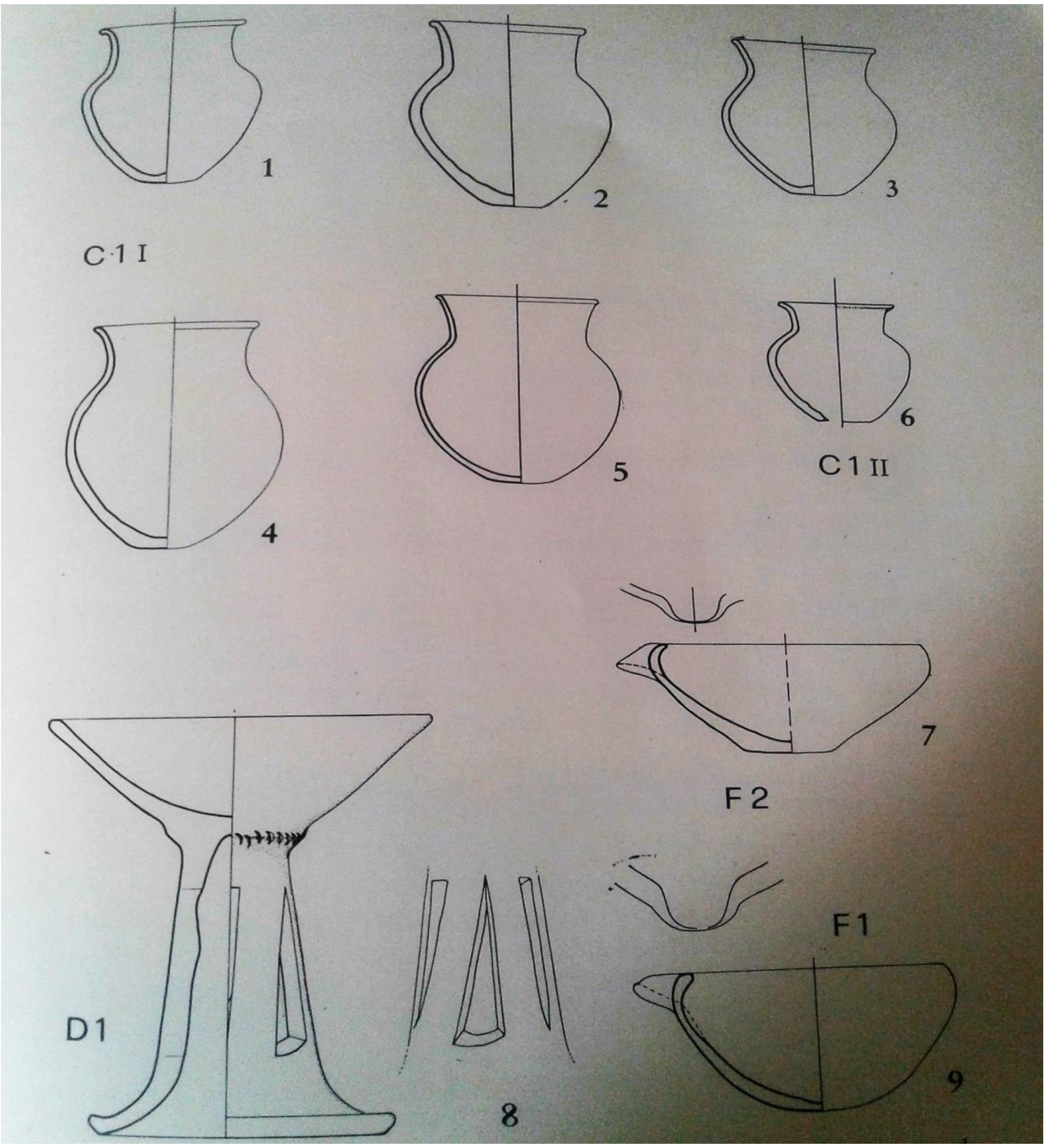


Fig.22(**D1**): High-stemmed bowl from Period VIA (Drawings from Frangipane and Palmieri, 1983: Fig. 28).