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NEW CHALLENGES ON DIMENSION STONES, FROM PORTUGAL TO THE WORLD

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Trigaches Marbles (São Brissos, Beja, Portugal): petrographic and geochemical characterization of a historical dimension stone

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Abstract

The exploitation of carbonate crystalline rocks in the Ossa-Morena Zone (OMZ) dates back more than two thousand years. Several historical exploitation poles in OMZ were identified based on the identification of distinctive marble lithotypes in Roman consumption areas, and some of those historical exploitation places were, subsequently, identified in situ through geo-archaeological works (e.g. Almadén de la Plata, Estremoz Anticline). The distinctive macroscopic features of Trigaches Marbles also allowed to recognize their use on Roman architecture, but also in several buildings, namely in southern Portugal, along numerous historical periods until present days, which indicates a long lived history of exploitation of this dimension stone. The Trigaches Marbles are exploited in Trigaches - São Brissos parish (Beja, Alentejo), located at the SW border of the OMZ. The geological unit containing the Trigaches Marbles has been assigned to Cambrian (as most of the exploited marbles on OMZ), outcropping in a N-S elongated strip with approximately 1.5 km² of area. This unit contacts with Carboniferous magmatic bodies to the west and north, and with a predominantly metasedimentary unit, composed of schists and subordinate metavolcanic rocks, to the east.

At macroscopic scale, Trigaches Marbles can be light grey, dark grey or grey-scale banded marbles, showing a poorly developed subvertical to steeply dipping metamorphic banding, subparallel to the main unit trend. Marbles are mainly composed of calcite (generally above 97% of volume - just one sample has a proportion around 95%), exhibiting a well-developed non-oriented granoblastic texture, commonly with tendency towards polygonization of calcite grains. As minor mineral phases, quartz, opaque minerals, biotite or muscovite, and sporadically, scapolite and pyroxene were identified. Marbles are inequigranular, generally coarse to very coarse grained, although sometimes medium grained calcite is also present (grain size ranges from 0.5mm to 20-40 mm). Calcite crystals commonly present type 4 twins, indicating medium-high temperature recrystallization, in accordance with the grain size.

Major element geochemical data show great homogeneity, in accordance with mineral modal composition: CaO ranges between 52.2 and 54.8% whilst MgO varies from 0.4 to 1.0%, in accordance with the calcite nature of these marbles and the absence of dolomite; low concentrations of Al₂O₃ [0.8 - 0.1%], K₂O [0.0 - 0.2%] and Na₂O [0.0 - 0.3%] agree with low phyllosilicate contents and the absence of feldspars s.l.; SiO₂ can reach 2% of whole rock being related mostly to the presence of quartz (can reach 3% of modal composition); LOI range between 42.5 and 43.9%, mainly indicative of the CO₂ content.

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