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P25. PYROLYSIS COMPOUND-SPECIFIC NITROGEN ISOTOPE ANALYSIS ($\delta^{15}N$ PY-CSIA): NOVEL ANALYTICAL APPROACH FOR ARCHAEOLOGICAL STUDIES

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The measurement of stable isotopes has become an important tool within the field of archaeology. The isotopic trace of human and animal tissues and components (bone, collage, keratin, muscle, fat etc.) allowed insight into the diet of our ancestors in a specific period of time, as well as its relationship with various human pathologies. Furthermore, this technique informs about food origin and possibly also their commercial routes, as well as population migrations. Pyrolysis-compound specific isotope analysis (Py-CSIA) is a cutting-edge analytical approach able to provide, not only a precise identification of organic compounds in different complex matrices, but also additional valuable information about nature and origin of the materials based on their isotope composition. This technique is based on the coupling of a micro-furnace pyrolysis unit to a gas chromatograph equipped with an isotope ratio mass spectrometer (IRMS) as detector. The individual volatile pyrolysis products separated by gas chromatography are directed to a combustion or pyrolysis micro-reactor (GC-Isolink system) and finally the isotope composition of the gases produced measured in a continuous flow IRMS via a interface unit. With this technique it is possible to make direct determinations of stable isotope ratios (i.e. $\delta^{13}C$, $\delta^{15}N$, and $\delta^{2}H$) of specific compounds with minimum sample handling and pre-treatment, thus minimizing the chance of contamination and artefacts productions. In this communication, we introduce the Py-CSIA technique into the field of archaeology by studying the direct determination of the isotopic composition of human skeletons buried in medieval necropolises from Center and South of Portugal.

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P77. ASSESSMENT OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) IN BIOCHARS PRODUCED FROM CROP RESIDUES: IMPACT OF PYROLYSIS CONDITIONS ON THEIR POTENTIAL HAZARD

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Biochar, an emerging highly aromatic porous material produced by pyrolysis of organic residues[1] is considered a good amendment for degraded soils. Thus, the interest in using biochar as soil or manure conditioner is continuously increasing during the last decade. Nevertheless, during the pyrolysis process persistent organic pollutants such as polycyclic aromatic hydrocarbons (PAHs) are formed due to incomplete combustion[2]. These PAHs may enter the environment when the biochar is applied as soil conditioner. The aim of this study was to discern how the pyrolysis conditions affect the risk of PAHs exposure from biochars, thus we examined the total and individual contents of the 16 US EPA PAHs in biochars produced using three different pyrolytic reactors from biomass of rice husks, wood, wheat and sewage sludge at temperatures ranging from 400 to 600 ºC. Results of this study show that pyrolysis conditions are the key factor in the total amount of PAHs present in biochars. The maximum amount of PAHs was observed for the biochar produced in the batch reactor at 400 ºC and decreased with increasing temperature. Increasing the residence times had not significant effect on the PAHs. Looking for a more reliable risk assessment of potential exposure to PAHs in biochar than the thresholds solely based on the $\sum$PAHs, the total toxic equivalent concentrations (TEC) of the biochars were calculated. TEC values confirmed the need of separating the syngas and bio-oil from the solid phase[3]. Results of this study constitute valuable information in the development of strategies for producing biochars with minimum risk of PAHs contamination.

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