Luminescence dating of negative archaeological features in weathered and calcite-rich lithologies

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Negative archaeological features (NAF), associated with Neolithic and Chalcolithic societies, are being investigated in Alentejo (Southern Portugal). These NAF include pits and ditches excavated in different geological contexts of the Ossa Morena Zone, comprising highly weathered materials from the Miocene (calcite-rich), from granites and from diorites & associated gabbros. The NAF were filled with a stratified accumulation that occurred after abandonment. This work aims to contribute to understanding the fill processes and to explore aspects of dose rate ($\dot{D}$) and absorbed dose (D) determination, and to establish chronologies for the NAF, especially considering that most of them have a scarcity of artefacts and organic remains. A total of 25 dating and 58 profiling samples were measured. Profiling analysis, of coarse quartz, and coarse and fine polymineral fractions, were used to estimate sensitivity and D, using IRSL, OSL and TL signals [1]. SAR-OSL analysis of 160-250 μm and 4-11 μm quartz grains was used for D determination of dating samples. *In situ* and high resolution lab' gamma spectrometry were combined with instrumental neutron activation analysis (INAA) to estimate $\dot{D}$. INAA and X-ray diffraction were used to obtain chemical and mineralogical composition. The main mineralogical association found for NAF fill materials excavated in calcite-rich lithologies is calcite > phyllosilicates ≥ quartz ± feldspars (traces of hematite and dolomite); in weathered granites is quartz = K-feldspars > plagioclase ≥ phyllosilicates; and in weathered diorites is plagioclase = phyllosilicates > calcite > quartz >> K-feldspars = amphibole. Profiling sample's results for luminescence, geochemistry and mineralogy indicate different phases of infill, and the calcite role in luminescence behavior. Coarse quartz OSL sensitivity (100 – 0.8 kcts/g) is positively correlated with calcite, and negatively with rare earth elements, Zr, Hf, Ta, Th, U, and weathering indices. In some samples D was affected by residual signals, and evaluation of $\dot{D}$ was complicated by high calcite content (alteration of water retention properties, and possible K and U mobility) and/or Rn losses, but dating results from 14/25 samples were in the expected time range.

[1] Rodrigues, A.L., Burbidge, C.I., Dias, M.I., Rocha, F., Franco, D., Prudêncio, M.I., Valera, A.C. 2013 Luminescence and mineralogy of profiling samples from negative archaeological features. Mediterranean Archaeology and Archaeometry 13, 37-47.

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