

FTIR and INS Study of Lower Palaeolithic Burned Animal Bones from Vértesszőlős (Hungary)

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The discovery of the Lower Palaeolithic site Vértesszőlős (Hungary) in the 1960s excelled among contemporary finds by various features; i.e., presence of human remains, multiple habitation layers, abundant scientific evidence and last but not least, the presence of fire at a site dated to the second glaciation period (Mindel) [1]. Traces of fire were observed in the form of hearths with radially arrayed, broken long bones (3-5 cm) with visible proofs of burning: intensive black colour.

Archaeological bone samples of burned and unburned appearance from Vértesszőlős excavation were analysed by Fourier transform infrared spectroscopic (FTIR) technique and inelastic neutron spectroscopy (INS) and compared with results of modern bones.

In the FTIR spectrum of bone with the most burned appearance, compared to that of unburned sample, an extra band at 1050 cm⁻¹ (shoulder) starts to grow up. After oven experiment of fresh bone (heated up to 600 °C) a well defined splitting at 1047 and 1038 cm⁻¹ also occurs, presumably due to apatite transformation. The relative intensities of 1102/1043 cm⁻¹ and 604/565 cm⁻¹ are also changed. Crystallinity index (CI) calculation based on FTIR measurements revealed, however, that burnt bones have a lower CI value compared to the 'unburned' one [2].

INS spectra are particularly sensitive to groups associated with hydrogen and relatively insensitive to phosphate and carbonate in bone. No significant difference between spectra of 'burned' and 'unburned' bone samples with near CI values were detected indicating no difference in -OH substitution. However, changes in the phosphate lattice mode vibrations and in the baseline level of the burned bone with the lowest CI value was observed. Detailed FTIR imaging study on the latter sample revealed indeed some traces of degraded humic acid on the bone surface.

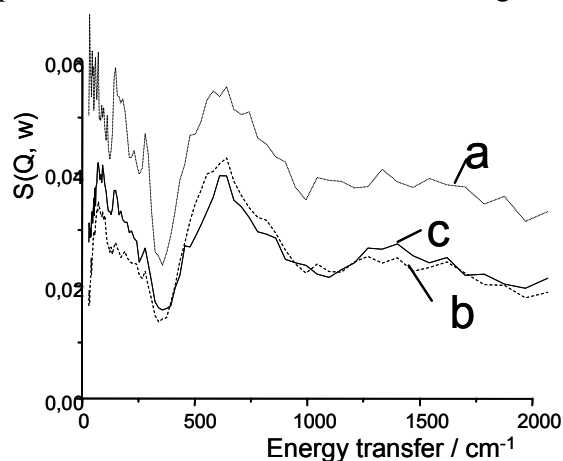


Fig. 1: INS spectra of: 'burned' bone sample with lowest CI (a), 'burned' (b) and 'unburned' (c) bone samples.

[1] M.Kretzoi, V.Dobosi: *Vértesszőlős, Man, Site and Culture*. Budapest, Akadémiai Kiadó 1990.

[2] J.Mihály, J.Mink and L.Hajba, *Archaeometry Workshop*, 2006/3, (URN: urn:nbn:hu-4106, URL:<http://www.ace.hu/am>).

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