

VIBRATIONAL SPECTROSCOPIC STUDY OF LATE NEOLITHIC PAINTED CERAMICS FROM SZOMBATHELY-OLADI PLATÓ (WESTERN HUNGARY)

Mihály J.¹-- Veres M.²--Tóth A.³--Tóth Zs.⁴--Ilon G.⁴

¹*Institute of Structural Chemistry, Chemical Research Center HAS, H-1525 Budapest, P.O.Box 17, Hungary*

²*Research Institute for Solid State Physics and Optics HAS, H-1525 Budapest, P.O.Box 49, Hungary*

³*Research Institute for Technical Physics and Material Sciences HAS, H-1525 Budapest, P.O.Box 49, Hungary*

⁴*Savaria Museum, H-9701 Szombathely, P.O.Box 14, Hungary*

During the excavations in the years of 2006 and 2007 on ‘Szombathely–Oladi plató’ (western Hungary) a settlement of the final Neolithic, the earliest Lengyel Culture was found. This period is characterised by polichrome (various shades of red, yellow and white) painted pottery and as considerable site as ‘Sé–Malomi dúlő’ belongs to it. Since we have a very poor knowledge about the minerals used as pigments and about the techniques to fix it on the vessel walls, we decided to apply various chemical and physical analyses to answer our questions.

The identification of pigments on archaeological materials is fundamental for understanding of an object’s history, to verify their authentication, solving certain restoration and conservation problems. Our investigation strategy was based on the techniques of infrared and Raman spectroscopy to study the mineral (and possibly organic) content of the samples, backed up by other techniques, like scanning electron microscopy (SEM). Raman spectroscopy (FT-Raman and microRaman), together with FTIR microscopy are extremely effective in study of archaeological materials due to their non-destructive, non-invasive properties, allowing *in situ* measurements of samples like decorated pottery fragments and paint nuggets.

We investigated also raw materials of pigments, found at the excavation site, which were supposed to be similar to the applied for ceramics. One piece of red ochre raw pigment of pure haematite was identified. On ceramic fragments, however, the red decoration’s coloring component was found to be mercury sulfide (HgS), mixed with kaolinite. Both IR, Raman measurements, both elemental analysis carried out by EDX supply this observation. The homogeneity of painting applied to the ceramic fragments, demonstrated by FTIR microscopy, suggest that the components were mixed

before the fixation to the vessel. The white painted parts consist of pure calcite.

A more detailed analysis and spectral interpretation could also provide information regarding the painting techniques, possible binder materials used. All these information, together with the identification of analytical compositions may lead to assignment of historical and geographical provenance.

[1] P. Hameau, V. Cruz, E. Laval, M. Menu, C. Vignaud, *L'Anthropologie* 105 (2001) 611-626.

[2] J. L. Mortimore, L.R. Marshall, M. J. Almond, P. Hollins, W. Matthews, *Spectrochimica Acta Part A* 60 (2004) 1179-1188.