

## MINERALOGICAL AND PETROGRAPHICAL STUDY OF MIDDLE BRONZE AGE CERAMICS FROM DERŞIDA (NW TRANSYLVANIA, ROMANIA)

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Twenty two fragments selected from hundreds of pottery remnants excavated in 60s at Derşida site in the north-western part of Transylvania (Romania), were studied by polarized light microscopy, X-ray powder diffractometry, scanning electron microscopy (SEM) and thermal analyses. Archaeologically, the pottery remnants belong to the Wietenberg culture (around 1800-1300 BC), *i.e.* Middle Bronze Age. The potsherds have a brownish-grayish colour, sometimes even blackish, with a smoothed surface, frequently decorated by incision or imprinting.

Microscopically, the ceramic body is composed from a clayey matrix, in which various nonplastic inclusions (clasts) and voids occur. Granulometrically, most of the samples (77%) have coarse characteristics, while 23% belong to the semifine category. The clayey matrix is thermally sinterized and has an amorphous-crystalline fabric. The porosity, expressed by primary and secondary pores, is relatively high. The inclusions are represented by crystalloclasts (quartz, plagioclase feldspar, biotite, muscovite, calcite and rarely garnets, epidote, zircon, titanite, tourmaline, apatite), lithoclasts (various metamorphic, magmatic and sedimentary rocks), ceramoclasts (potsherds) and rare bioclasts (fossil remnants). In cross section a general chaotic orientation of the lamellar particles, rarely a slight parallel arrangement to the wall of the ceramics can be noticed.

X-ray diffraction patterns show the presence of mineral components as muscovite, biotite, chlorite, feldspar as well as the thermally-modified lines of kaolinite, illite, montmorillonite and illite/montmorillonite. The thermal analyses point to endothermic effects at 50-200 °C, due to the adsorbed-water

loss, at 400 °C, due to the loss of OH<sup>-</sup> from the clay minerals structure and the last, at 650-800 °C, due to the structural collapse of some of the clay minerals. SEM images reveal different degrees of sinterization-melting processes which had affected mainly the clayey matrix and less the clasts.

The mineralogical composition of the matrix points out the use of a reddish clay (Late Pleistocene age) occurring west of the site, as raw material. The clasts composition reflects that the ancient potters used sands from the alluvial sediments of the Crasna river, as tempering material for ceramics. Based on the microscopical observations, the modification of the X-ray diffraction lines of clay minerals, the thermal analyses and SEM, compared with reference data (*e.g.* MAGGETTI, 1982; CULTRONE *et al.*, 2001, *etc.*) we may consider that the firing temperature of the Middle Bronze Age ceramics from Derşida exceeded 600 °C (kaolinite basal line is missing) but not more than 900 °C (as calcite is still thermally unchanged).

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### References

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