FIRING TRANSFORMATIONS IN LATE BRONZE AGE CERAMICS FROM TRANSYLVANIA (ROMANIA)

Corina Ionescu[1] -- Lucretia Ghergari[1] -- Volker Hoeck[2] -- Viorica Simon[1]

[1]Babes-Bolyai University, 1 Kogalniceanu Str, RO-400084 Cluj-Napoca, Romania (corinai@bioge.ubbcluj.ro)
[2] Paris Lodron University, 34 Hellbrunner Str., A-5020 Salzburg, Austria

The studies of thermal transformations of clays and temper during firing support the understanding of the high-*T*, low-*P* transformations of silicate phases, both in artificial (*e.g.*, ceramics) and consequently natural (*e.g.*, pyrometamorphic) systems. In the same time, these studies can unveil the technological achievements and knowledge of raw material sources of ancient civilizations. And last but not least, the results may be used for the selection of paste composition necessary for restoration of ceramic artefacts during cultural heritage interventions.

Coarse and semifine ceramic potshards of Late Bronze Age (1400-1200 B.C.) found in North Transylvania (Romania), were studied by Optical Microscopy in plan-polarized light (OM), X-Ray Powder Diffraction (XRD), Scanning Electron Microscopy (SEM), Electron Microprobe (EMP), Attenuated Total Reflection Fourier Transform Infrared (ATR-FTIR) and Electron Paramagnetic Resonance (EPR) in order to identify the phases and their thermal transformation during the firing. The ceramics consists basically of a clayish matrix with combined crystalline and amorphous fabric and exhibits different degrees of sintering and vitrification. In the matrix, variable amounts of magmatic, metamorphic and sedimentary lithoclasts, as well as various crystalloclasts, ceramoclasts and rare bioclasts are present.

The study reveals small-scale thermal processes i.e. melting, diffusion, recrystallization, which affected the matrix and its relationship with the clasts. The most important is the change of the clayish matrix, where the particles are sticked together by sintering and/or melting processes. Fe migrated from the matrix into the softened rims of quartz grains. Parts of feldspar clasts became isotropic due to the collapse of the crystalline structure. The amorphous melt intruded into the cracks. New phases such as glass, gehlenite, wollastonite, hematite, anorthite, leucite, K-feldspar, and mullite formed as well.

The firing conditions for the Late Bronze Age ceramics could be approximated between 800 and 1000^{o}C. The mineralogical composition of

the matrix as inferred from the EMP data indicates that ceramics was obtained by mixing of kaolinitic-illitic and illitic-kaolinitic (±smectite) raw clays, with some Fe-oxihydroxide content. The clays could have been the Badenian kaolinitic-illitic and illitic-kaolinitic clays, located at hand. The petrographic and mineralogical composition of the clasts points to the alluvial sandy sediments as tempering materials, derived from the Somes River-flowing nearby the site.