ELECTRON MICROPROBE ANALYSES ON ANCIENT CERAMICS. CASE STUDIES FROM ROMANIA

CORINA IONESCU[1]*, VOLKER HOECK[2]

[1]*Babes-Bolyai University, Depart. Geology, RO-400084 Cluj-Napoca, Romania*
[2]*Salzburg University, Depart. Geography and Geology, 34 Hellbrunnerstr., A-5020 Salzburg, Austria*
cora22x@yahoo.com

Electron Microprobe Analysis (EMPA) is a widely applied technique in geological sciences, e.g. mineralogy and petrology. It has several advantages for the research of mineral-based materials, including ceramic and glass artefacts. The main benefit for the ceramic analysis is the possibility to identify components with a wide range of size, independent of their nature as primary minerals or firing products.
The identification of mineral components of the matrix can be very difficult, as it represents a more or less homogeneous mixture of extremely fine-grained compounds, usually smaller than the focused beam diameter. The use of a defocused beam (20 microns) may result in an average composition of matrix for the irradiated area. The most important problem is the frequently observed low sum of the quantitative analyses. This is due to the porosity of samples, the incomplete dehydroxylation during the firing, or the rehydration and/or rehydroxylation during the burial.
The EMP studies performed on Late Bronze Age ceramics from Ilisua, Transylvania (Romania) revealed a highly porous ceramics, composed of an illitic-kaolinitic matrix and various clasts (fragments of minerals such as quartz, feldspars, micas, ilmenite, pyroxenes, garnets, zircon or amphibole, as well as fragments of various rocks i.e. volcanic tuffs, andesites, basalts, rhyolites, granodiorites, sandstones, quartzites, micaschists, gneisses, amphibolites). Bioclasts, soil aggregates and four different types of ceramoclasts (potshards) are also present.
Additionally, several new phases, most likely formed during the firing process, were identified: K-feldspar, An-rich plagioclase, silica glass. They are metastable phases, with often a non-stoichiometric composition, thus difficult to characterize in terms of mineralogy. Frequently they are "contaminated" with elements such as e.g. additional Fe, K, Al or P trapped inside the new lattice. The distinction among the primary and the secondary (firing) phases can be also relatively difficult, as the same mineral may occur as both.
The detailed knowledge of the mineral phase composition based on EMP analyses allows the classification of shards, and improves greatly the identification of the raw materials and their provenance, as well as the reconstruction of the technological conditions of firing.

Keywords: EMPA, Bronze Age ceramics, Romania.