Poster

Portable handheld XRF and μ-XRD examination of a late Roman copper cauldron

Zoltán May, Bernadett Bajnóczi, Viktória Mozgai, Zsolt Mráv

Institute of Materials and Environmental Chemistry, HUN-REN Research Centre for Natural Sciences

may.zoltan@ttk.hu

One of the famous examples of silver treasures from the late Roman period is the Seuso Treasure, the pieces of which (14 silver objects so far) were found hidden in a large copper cauldron, buried in the ground. The provenance (finding location) of the cauldron is uncertain, but it is currently kept in the Hungarian National Museum. The cylindrical, large-sized cauldron has a diameter of 83 cm, a height of 32.5 cm and a capacity of 150 litres. This cylindrical cauldron with an originally convex bottom has a stepped wall made of two separate hammered copper sheets joined together with hammering, riveting and soldering. The wall is joined to the bottom with a crenelated seam. The cauldron was most probably manufactured in the 3rd or 4th century AD. Based on its shape and manufacturing techniques, it belongs to a type which was widespread in the Rhine and Danube regions of the Roman Empire in the 2nd-4th centuries AD [1, 2]. The surface of the copper cauldron is heavily corroded, its entire surface is covered with a green patina layer, and soil residues were also found on the surface. During material analysis, both elemental and phase analytical measurements were performed. Using a handheld XRF (X-ray fluorescence spectrometry) device, we determined the elemental composition of the surface of the cauldron at several points, taking into account the corrosion products forming layers of different thicknesses. According to the results, the material of the cauldron has a very high copper content suggesting that its raw material is unalloyed, pure copper. After sampling, the corrosion products on the surface were determined and identified in cross-section, layer-by-layer, using the μ-XRD (micro-X-ray diffraction) and SEM-EDX (scanning electron microscopy coupled with energy-dispersive X-ray spectrometry) techniques. As a result of the analyses, we were able to identify the passive and active corrosion products (copper oxide (cuprite), copper carbonate (malachite) and copper chloride (nantokite), copper hydrochloride (paratacamite/atacamite), copper sulphate (brochantite), respectively), with the help of which we also gained insight into the burial conditions of the cauldron [3].

[1] Nagy, M. & Tóth, E. (1990). The Seuso Treasure. The Pannonian connection? Minerva 1/7

[2] Nagy, M. (2012 (2012). A Seuso-kincs pannoniai kapcsolatai (Connections of the Seuso Treasure to Pannonia), edited by Zs. Visy & Zs. Mráv, pp. 49-63. Pécs: PTE Régészeti Tanszék – GeniaNet, 49–63.

[3] Mozgai, V., Bajnóczi, B., Mráv, Zs., Kovacsóczy, B. & Tóth, M. (2019). Archeometriai Műhely 16/1, 29.

The measurements were performed within the framework of the Seuso Research Project (2014-2019) supported by the State of Hungary.