

ENCAPSULATED INDUSTRIAL PROCESSES: SLAG-TEMPERED CERAMICS AND ITS IMPLICATIONS FOR PREHISTORIC METALLURGY IN THE LOWER INN VALLEY

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The use of slag-tempered ceramics is a characteristic feature of prehistoric inner-Alpine settlements associated with Cu-ore deposits. Slag-tempered ceramic fragments from three sites in the Lower Inn Valley were investigated with mineralogical, petrographical and geochemical methods: (1) the hilltop settlement Kiechlberg near Thaur, (2) the gravel quarry Kundl-Wimpissinger and (3) the cemetery St. Leonhard site, latter both in the vicinity of Kundl. The Kiechlberg (1) site is a small hill on the south face of the Karwendel mountain range, a few kilometers northeast of Innsbruck. Superficial finds of artefacts and metallurgical slags led to first archaeological excavations in the frame of the Special Research Programme HiMAT (supported by the Austrian Science Fund FWF). On the Kiechlberg, a huge amount of ceramic and flint artefacts as well as metal objects made of copper and bronze were collected during the investigation of a prehistoric layer of debris, indicating an occupation of the site from Late Neolithic up to Middle Bronze Age. One specific feature was the occurrence of slag-tempered ceramic fragments. The slag fragments are <5 mm in size and often occur greenish due to alteration of Cu-minerals. The slag mineral assemblage is olivine + clinopyroxene + spinel + Cu-droplets. Chemical compositions of the Cu metal droplets are identical to compositions from slag samples from the site itself. At the gravel quarry Wimpissinger (2) near Kundl a Late Bronze Age settlement was discovered with a metal workshop containing slag residues and ceramic fragments. In these ceramic fragments slag temper was also found. The mineralogy of the analysed slag fragments as well as the slag temper indicate that the ore used to produce Cu-metal came from the nearby fahlore-group mineral deposits of Brixlegg (embedded in Devonian dolomites, "Schwazer Dolomit"). Significant amounts of Ni and Co also indicate that ores of Triassic age ("Schwazer Trias") were also used. On the south side of the Inn Valley near the village of St. Leonhard (3) near Kundl (Tyrol, Austria) a few pieces of bronze and pottery have been discovered on a field. Here, a Late Bronze Age (Urnfield period) cremation burial site is suggested. Because of the greenish spots observed on one of the pottery fragments it was assumed that some of the jars could have been tempered with slag sand. Slag sand/grit is a by-product of copper ore smelting processes and can be found in the copper smelting sites Mauk A in the nearby Mauken valley, only two kilometres southwest, as well as at the smelting site in Rotholz (Buch i. T.). Mineralogical investigations of ceramic fragments confirm the first assumption that in the three above mentioned sites primarily slag fragments were used as temper. The slag temper has a characteristic chemical/mineralogical composition. The metal/copper inclusions in the slag have typical "fahlore-signature" containing Sb and As. The chemical composition and textures of the silicate phases are comparable to the Late Bronze Age copper slags from the adjacent site "Mauk A". Chemical analysis of the slag-tempered fragments from all three sites indicate so far that local fahlore-group minerals from the Lower Inn Valley have been used.