WHERE DO THE ORES COME FROM? THE STRANGE CASE OF THE SLAGS FROM THE FENNHALS SMELTING SITE (KURTATSCH, SOUTH-TYROL)

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Introduction

In the course of this investigation slags from the late Bronze Age copper melting site “Fennhals” at Kurtatsch in South Tyrol were investigated. The main objective of this study was to determine the possible ore provenance. Therefore samples of known copper ore occurrences from South Tyrol and the Trentino were investigated by ore microscopy and electron microprobe analysis. Ore samples from the following localities were investigated in this work: Prettau in the Ahntal, Pfunderer Berg near Klausen, Eys in the Upper Vinschgau, Schneeberg/Rednaun, the La Bedovina mine in Predazzo and St. Pankraz in the Ulten Valley. This investigation was accompanied by smaller prospecting in the Nonsberg area to investigate possible ore deposits. In the area between Tuenetto, Söll and Vervò samples were also collected but pyrite occurs to be the only ore phase.

Archaeological background

The smelting site Fennhals is one of the most important Late-Bronze Age Cu-smelting sites in South Tyrol. Contrary to other prehistoric Cu-smelting sites in the Eastern and Southern Alps it is located far away from Cu-ore deposits. Archaeological excavations yielded five smelting furnaces of which two are exhibited in the museum „Zeitreise Mensch“ and three are in the Südtiroler Archäologiemuseum in Bozen (Fig. 2). In the area firing sites were also discovered which were likely used for roasting the ores prior to smelting. In addition to these “industrial” remains slags, slagged ceramic fragments and remains of burners were also found.

Petrography

The slag samples from Fennhals basically consist of a glassy matrix and the slag phases olivine and clinopyroxene (Fig. 3). Not fully molten quartz fragments are rare. Copper sulfides such as covellite, chalcocite, bornite, digenite and chalcopyrite frequently occur (Figs. 4, 5). Circumstantial the presence of pyrhotite, magnetite and hematite can be observed. Metal droplets in the slags occur as small rounded segregations that reach a maximum diameter of 300 microns. Often these metal droplets exhibit a very heterogeneous chemical composition. Interestingly frequently Pb-droplets occur dispersed between olivine crystals.

Mineral chemistry of the metal droplets

The following elements were analysed using electron microprobe analyses: As, Ag, Cu, Zn, Pb, Sn, Fe, Sb, Bi and Mo. In most cases copper forms the main component, only in particular cases bismuth, silver or lead dominate. With respect to Sn most metal droplets contain 0.1 to 2.0 wt.% Sn. The mean Sn content therefore is around 1.0 wt.% (Fig. 6). In one sample the Sn content is much higher and maximal values reach 56.87 wt.%! About the provenance of the Sn contents only guesses can be made. Due to the heterogeneous composition an unambiguous assignment to one of the known ore deposits is not possible yet.

Discussion

Although the extremely high Sn-contents are restricted to one slag sample which not only shows metal droplets with Sn contents of 32.99, 38.23, 58.87, 29.79 and 24.09 wt.% but also metal droplets with <1 wt.% Sn, it nonetheless indicates a highly chemically heterogeneous ore charge. Chemical data indicate some important relations between the analysed elements. High Sn contents show a positive correlation with elevated Ag and Bi contents. This indicates that ores containing Sn-phases (stannite, cassiterite) also contain Ag-Bi-bearing phases. Elevated As-contents also correlate with increasing Sb-contents indicating the possible presence of tetraxtite-rich fahlore group minerals. The occurrence of metallic Pb as well as Bi indicates the presence of Pb-Bi-bearing phases in the charge. If the ores come from one source these hose data point to a polymetallic Cu-Zn-Pb-Ag-As-Sb-FetSnZBiMo ore deposit. Possible suitable ore deposits based on their polymetallic character and/or their occurrence of Sn phases could thus be: Pfunderer Berg (so far no Sn-phases), Schneeberg (very little stannite), Prettau, La Bedovina (subordinately cassiterite) und Ultental (also so far no Sn-phases) but an unambiguous assignment to one of these ore deposits is not possible yet. Other possibly relevant ore deposits could also be Martell, Malga Tassulla, Laurein, Lavis, Villnöss, Stilfser Joch.