

### **Rhenium Deportment in Samples from the Spremberg-Graustein-Schleife Kupferschiefer Deposit**

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Rhenium is a valuable rare element and is of strategic importance due to its indispensable role in high-temperature superalloys such as those used in jet engines and turbine blades. Global mine production of rhenium is almost entirely a byproduct of copper production from porphyry and sediment-hosted copper deposits, mainly through the recovery of molybdenite concentrates. In the Kupferschiefer sediment-hosted copper deposits of Central Europe, rhenium is recovered during the smelting process of copper concentrates in the flue gas. While the ore is known to contain elevated Re concentrations, the mineralogical controls on its distribution remain poorly constrained. In this study, we present a comprehensive assessment of Re deportment within the Spremberg-Graustein-Schleife Kupferschiefer deposit in Lusatia, Germany.

Representative samples from the mineralization interval of three drill-cores were analyzed for bulk geochemistry, quantitative modal mineralogy by SEM-based automated mineralogy (MLA and TIMA), and sulfide mineral composition by LA-ICP-MS. The results reveal that Cu-S minerals, particularly chalcocite group minerals, in the Kupferschiefer and overlying hanging wall carbonate rocks, are locally enriched in Re. However, in the majority of samples, up to 90% of the total Re content remains unaccounted for within the analyzed sulfide phases. Since molybdenum-bearing minerals were not identified using high resolution SEM-based mineralogy, it is likely that Re is hosted by other phases. In this regard, a strong positive correlation between Re and total organic carbon (TOC) was observed and indicates that Re is likely associated with the organic matter. The hydrophobic nature of this phase and its flotation behavior alongside sulfides during ore processing may contribute to the apparent recovery of Re during smelting.