

Geochemical and isotopic investigations on hydrothermal vein mineralizations in the Harz Mountains, Germany

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The Harz Mountains host historically important fluorite-barite and polymetallic sulfide vein systems. We studied the geochemistry of hydrothermal fluorite-carbonate of the Strassberg/Rottleberode/Brachmannsberg district in the Eastern Harz, and the geochemistry of carbonate gangue in the classical Pb-Zn-Ag vein district of Bad Grund-Lautenthal in the Upper Harz Mountains. The carbonate gangue in the Upper Harz Mountains has consistently elevated REE contents due to abundant μm -sized REE carbonate inclusions (mainly Y-synchisite) which control the LREE-dominated hump-shaped REE patterns without Ce, Eu or Y anomalies. The vein systems of the Eastern Harz Mountains have very variable REE patterns at relatively low REE levels with negative and minor positive Eu anomalies and mostly strongly positive Y anomalies. Sm-Nd isotope data on fluorite do not allow any age information. Calculated epsilon Nd values for an assumed formation age of 210 Ma are all negative (-2 to -16). $^{87}\text{Sr}/^{86}\text{Sr}$ ratios range from 0.70991 to 0.71828. Fluorite formation was apparently multi-stage from heterogeneous fluid compositions, as also revealed by textural heterogeneity.