

Public Abstract

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Title:Fluorine concentrations of ore fluids in the Illinois-Kentucky district: Evidence from SEM-EDS analysis of fluid inclusion decrepitates

The Illinois-Kentucky district is one of the world's largest producers of fluorite, with over 12 million tons of fluorite having been mined since 1870. This study focused on two research questions, why is Illinois-Kentucky rich in fluorite, and what is the nature of the ore fluids responsible for precipitating the ore. Our hypothesis was that the ore fluids in Illinois-Kentucky were anomalously rich in the element fluorine. In order to test our hypothesis, this study measured the fluorine composition of decrepitated fluid inclusions hosted in the mineral sphalerite, using energy dispersive spectroscopy on a scanning electron microscope. The results show that the fluorine concentration of the ore fluids were on the range of 100's to 1000's of ppm. Ore fluids with fluorine concentrations in this range would have been especially acidic ($\text{pH} = 0$), that would have promoted the precipitation of fluorite, while also suppressing the precipitation of metal-sulfide minerals. Also the fluorine would have most likely originated from anomalously fluorine rich igneous rocks, or sedimentary phosphorite deposits within the district.