ABSTRACT

Experiments by evacuated silica tube method were conducted in the PbS-ZnS-FeS system at 600 °C in the presence of extra S. The results indicate, contrary to earlier studies, that melting in the PbS-ZnS-FeS system can happen at as low as 600 °C, but in the presence of Cu and S in excess of total metal. The minimum temperature of melting was determined to be 593 ± 2 °C.

The melt composition varies along a quaternary cotectic almost having a fixed ZnS-content of about 5 mol %. Although sphalerite, pyrite and galena are the liquidus phases in the experimental run products at 600 °C, pyrite and sphalerite appear to be saturated in the melt earlier than galena as the melt cools. The fractionated melt is expected to be enriched in PbS as well as Cu_2S.

Both sphalerite and pyrite were observed to contain more than stoichiometric proportions of S and the melt was invariably metal enriched, especially at lower temperature. The S-deficiency of the melt seems related to the melting of pyrite, becoming almost negligible at 760 °C. The consequence of this behavior is the stabilization of metallic phases in the last fraction of the cooling melt, although the melt itself is produced under high S-fugacity.

In extremely Fe-poor runs a ZnS-rich PbS melt was encountered. This melt may solidify to a galena containing considerable ZnS, as found in the Sargipali Pb-Cu deposit, India. Also the melt composition approaches the bulk ore composition of Sargipali with increasing temperature, indicating that the Sargipali deposit and other Zn-poor Pb-Cu deposits elsewhere could have resulted from anatexis of preexisting sulfide deposit.

In experiments incorporating Ag, lowering of melting temperature was observed. However, the amount of melt produced was reduced.

High mobility of elements was observed in the experimental run products stored at room temperature under vacuum. Extensive modification of the phase compositions suggests that textural indications should be given more importance in identifying signatures of melting in sulfide ores. This also indicates why melt assisted ore remobilization has gone largely unrecognized.

***Key Words**:* sulfide, partial melting, eutectic, remobilization, reequilibration, nonstoichiometry.