THE CHEMISTRY OF LEAD-ZINC DEPOSITION AND THE PROBLEM OF ZONING

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ABSTRACT

The problem of the relative positions of galena and sphalerite (Pbs and ZnS) in the "Mississippi Valley" and other types of lead-zinc deposits is attacked from the point of view of a magmatic origin. Evidence has been generally cited to show that, on the basis of solubility determinations, sphalerite should occur nearer the surface and later paragenetically than galena. The reverse order holds in nature.

Arguments based upon available data show that this unexplained order of deposition is probably due to (1) supersaturation phenomena, or (2) the formation of complexes.

Detailed experimental work, subjected to careful chemical control, shows that neutral chlorides are effective in forming complexes with lead; thus increasing its solubility. At the conditions of deposition of the Mississippi Valley deposits (ca. 100° C. and 60 at.) 2.0 normal $CaCl_2$ would be effective in producing the observed mineral relations. This concentration is in accord with that found by Newhouse in fluid inclusions in the galena. It appears probable that the solutions were relatively concentrated yet generally neutral in composition.