American Mineralogist, Volume 88, pages 1197–1203, 2003

The structural evolution of mercury sulfide precipitate: an XAS and XRD study

JOHN M. CHARNOCK,[1,2,3,*] LESLEY N. MOYES,[2] RICHARD A. D. PATTRICK,[3] J. FREDERICK W. MOSSELMANS,[1] DAVID J. VAUGHAN,[3] AND FRANCIS R. LIVENS[2]

[1]CLRC Daresbury Laboratory, Warrington, Cheshire WA4 4AD, U.K.
[2]Department of Chemistry, University of Manchester, Oxford Road, Manchester M13 9PL, U.K.
[3]Department of Earth Sciences, University of Manchester, Oxford Road, Manchester M13 9PL, U.K.

ABSTRACT

We investigated structural changes during precipitation of HgS from sulfidic solutions using X-ray absorption and X-ray diffraction techniques. The results show that initially an unstable low Hg coordination complex forms that is probably chain-like in structure, with one sulfide atom at 2.35 Å and one at 2.97 Å. This is rapidly transformed to a four-coordinate mercury sulfide compound that initially forms as clusters with the local ordering characteristics of cubic metacinnabar. However, during aggregation the black Hg-S precipitate loses its initial longer-range ordering and becomes pseudocubic. As it ages, the pseudocubic structure transforms to a cubic structure, and then to stable crystalline metacinnabar. This study provides clear evidence that the precipitation and formation of metal sulfides is a complex multistage process.