

Rod-based sulphosalt structures derived from the SnS and PbS archetypes

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Abstract: In the present review on the rod-based sulphosalt structures we describe the fundamental features of their large- to medium-scale crystal chemistry. The principal, lozenge-shaped rods in these structures represent portions based on the SnS or PbS archetype, with their surfaces being alternatively of the pseudo-tetragonal or pseudohexagonal (often sheared) type. The formation of the rod-based sulphosalt structures can then be understood as a recombination of these rods into a structure by means of non-commensurate Q:H interfaces. All of these structures show distinct accumulation of Sb and Bi in rod interiors (that represent the lone electron pair micelles) and of Pb (and other large cations) on the pseudotetragonal surfaces of the lozenge-shaped rod.

Detailed analysis is given of the first largest category of rod-based sulphosalt structures, those based on rods interconnected into layers. Twelve different types of such layers have been recognized, based primarily on the mode of interconnection of the rods into layers; further subdivision in each category reflects the characteristic dimensions of their lozenge-shaped cross-sections. All these derivations result in characteristic geometry and stoichiometry of these structures, treated here in some detail. A survey of matches and combinations of different rod-layer types observed or envisageable during the structure-recombination process concludes the part on rod-layer based structures.

The second part of the review starts with a survey of pure (i.e. not layer-like) rod-based sulphosalt structures and proceeds to lay out classification principles for the three fundamental categories of rod-based structures: (1) the layer-, (2) the chess-board, and (3) the cyclic category, with the suggestions for their further subdivision. The present review deals with the most important Pb-Sb, Sn-Sb, Pb-Bi-Sb as well as the selected Pb-Bi, Ba-Bi and other sulphosalts, eventually with minor contents of Cu or Fe.

Key-words: sulphosalts, crystal structure, classification.

1. Introduction

The present review attempts to evaluate the medium- and large-scale crystal chemistry of sulphosalts which contain combinations of (mostly lozenge-shaped) rods based on SnS or PbS archetypes. These rods with simple internal topology (albeit with not so simple internal bonding situation) and usually clear-cut external surfaces were found to represent a powerful and convenient means of structure description at an intermediate level.

For the large family of rod-based sulphosalts with lozenge-shaped rods organized into period-

ically constricted layers, 12 layer types are defined and their geometric and compositional characteristics are derived. These layer types differ in the way the rods in them are connected; furthermore for all layer types the layers may differ in the thickness and width of lozenge-shaped rods (i.e. in their so-called N' and N characteristics). According to the possibilities given by the interlayer fit, two parallel groups of such structures exist, a) those composed of only one kind of layer and b) those necessarily built from two alternating types of layer. All known relevant sulphosalt (and related) structures are discussed within this reference framework. An attempt is