Investigations in the Systems Ag-Hg-X-O (X = AsV, SeIV, SeVI): Hydrothermal Single Crystal Growth of Ag₃AsO₄, AgHgI₂AsO₄, AgHgIIAsO₄, Ag₂SeO₄ and the Crystal Structure of Ag₂HgII(SeO₃)₂

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Single crystals of the already known phases Ag₃AsO₄, AgHgI₂AsO₄, AgHgIIAsO₄, Ag₂SeO₄ and of the hitherto unknown compound Ag₂HgII(SeO₃)₂ were obtained under hydrothermal conditions (250 °C, 5 d) from starting mixtures of the metal nitrates and the respective acids. Both Ag₃AsO₄ and AgHgI₂AsO₄ are isotypic with the corresponding phosphates, Ag₃PO₄ and AgHgI₂PO₄, whereas AgHgIIAsO₄ and Ag₂SeO₄ crystallize in the thenardite (Na₂SO₄ (V)) structure. All crystal structures were refined by means of single crystal X-ray data. The crystal structure of Ag₂HgII(SeO₃)₂ \([Pbca, Z = 8, a = 6.8206(11), b = 11.237(3), c = 16.876(2) \text{ Å}, 1677 structure factors, 101 parameters, \(R[F^2 > 2\sigma(F^2)] = 0.0193, wR(F^2 \text{ all}) = 0.0394\)] consists of considerably distorted [AgO₆] and [HgO₆] octahedra, and trigonal SeIV O₃ pyramids as the main building units. The [MO₆] octahedra build a complex framework by sharing common edges and corners, and the SeIV O₃ pyramids are located in the vacancies of this arrangement. The average Hg-O distance of 2.399 Å is significantly shorter than the average Ag-O distance of 2.551 Å. The geometries of the two crystallographically independent SeIV O₃ pyramids are very similar and the average distance and angle (\(d(\text{Se-O}) = 1.709 \text{ Å, } \angle(\text{O-S-O}) = 100.1°\)) lie in the characteristic range for a selenite(IV) group. A short comparative structural discussion between the various compounds obtained during the hydrothermal experiments is given.

Key words: Silver, Mercury, Selenites(IV), Selenates(VI), Arsenates(V)