Structures and Thermal Properties of Silver(I) (Poly)chalcogenide Halide Solid Solutions $Ag_{10}Te_{4-(q,p)}Q_{(q,p)}Br_3$ with Q = S, Se

Tom Nilges and Melanie Bawohl

Universität Münster, Institut für Anorganische und Analytische Chemie, Corrensstraße 30, 48149 Münster, Germany

Reprint requests to PD Dr. Tom Nilges. Fax: +49-251-83-36002. E-mail: nilges@uni-muenster.de

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Dedicated to Professor Gérard Demazeau on the occasion of his 65th birthday

X-Ray diffraction experiments, thermal analyses and EDX spectroscopy were performed to determine the structural and thermal properties of the solid solutions $Ag_{10}Te_{4-q}S_qBr_3$ and $Ag_{10}Te_{4-p}Se_pBr_3$. The present investigation completes the work on silver(I) (poly)chalcogenide halides, a new class of mixed electron and ion conductors, with the general composition $Ag_{10}Q_4X_3$ (Q = chalcogen and X = halogen). A high silver mobility within the polytelluride substructure and a pronounced polymorphism are characteristic features of these solid electrolytes. Phase transition temperatures are reduced upon the substitution of Te by the lighter homologs Se and S. Even low degrees of substitution lead to significantly lower phase transitions for the high-temperature polymorphs compared with $Ag_{10}Te_4Br_3$. A permanent disorder within the silver substructure is present for the maximally substituted sulfur containing phases.

Key words: Silver(I) (Poly)chalcogenide Halides, Ion Conductors, Thermal Analyses, Polymorphism