$Ag_{10}Te_4Br_{3-x}Cl_x$ and $Ag_{10}Te_4Br_{3-y}I_y$: Structural and Electrical Property Tuning of a Mixed Conductor by Partial Anion Substitution

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Dedicated to Dr. Bernard Chevalier on the occasion of his 60th birthday

X-ray powder and EDX phase analyses, thermal analyses, impedance spectroscopic measurements, and crystal structure determinations of selected phases are reported to highlight the structural and electric properties of the solid solutions $Ag_{10}Te_4Br_{3-x}Cl_x$ and $Ag_{10}Te_4Br_{3-y}I_y$. Bromide can be partially substituted by chloride or iodide up to $x = 1.6$ and $y = 0.2$, respectively, without changes in the structural properties of the tetramorphic, ion-conducting $Ag_{10}Te_4Br_3$. Results from X-ray powder phase analyses have been complemented by data of single crystal structure determinations of selected samples. At r. t. the fully ordered γ-$Ag_{10}Te_4Br_3$ structure type is realized in all chloride containing phases, but a partial iodide substitution leads to the stabilization of the disordered β-$Ag_{10}Te_4Br_3$ structure type. Impedance spectroscopic measurements reveal a significant increase by one order of magnitude of the r. t. silver ion conductivity of $Ag_{10}Te_4Br_{2.8}I_{0.2}$ as compared with $Ag_{10}Te_4Br_3$.

Key words: Silver Ion Conductors, Coinage Metal Polytelluride Halides, Chemical Property Tuning