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Investigation of silver and thallium(I) halide solid-solution-based crystals and fibers for the MIR

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Abstract

For further manufacturing of crystalline optical fibers, including photonic-crystal ones, prospective in the Mid-IR (2.0-40.0 μm), we grew and investigated AgBr–TlI and AgBr–($TlBr_{0.46}I_{0.54}$) solid solution crystals, which the polycrystalline optical fibers were then extruded from. X-ray analysis confirmed the charge obtained by means of thermal zone crystallization-synthesis technique was a perfect cubic crystal *a priori* at the stage of synthesis. We conducted the thermodynamic research of both systems – differential thermal analysis and X-ray analysis, by means of which we built and described their phase diagrams. Both diagrams proved to have wide homogeneity region, within which the cubic substitution solid solution crystals were grown up to 25 % wt. (14 % mol.) of TlI in AgBr–TlI and up to 50 wt. % (38 mol. %) of $TlBr_{0.46}I_{0.54}$ in AgBr–($TlBr_{0.46}I_{0.54}$). The optical fibers drawn from these crystals exhibit rather wide transparency region, which expands towards far IR region when thallium halide content in solid solution increases.

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