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The scientific grounds for the manufacturing of single crystals and infrared photonic crystal fibers based on them

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Abstract

We developed new $Ag_{1-x}Tl_xBr_{1-x}I_x$, $Ag_{1-x}Tl_xBr_{1-0.54x}I_{0.54x}$ crystals, which proved to be light-stable and transparent within the spectral region from 0.4 up to 45.0 μm. Their production technology, including non-traditional synthesis of multicomponent homogeneous batch and crystal growth via new growing devices KPCh-01 and KPCh-02, was therefore improved. By means of differential thermal analysis we investigated the phase equilibrium diagrams of AgBr-TlI and AgBr – ($TlBr_{0.46}I_{0.54}$) systems and determined the existence of homogeneous solid solution region. For the first system, the largest TlI content in the solid solution amounts to 25 wt. %; for the second one, the $TlBr_{0.46}I_{0.54}$ content is 50 wt. %. Photonic crystal fibers with nanocrystalline structure were also obtained by extrusion from the crystals above, the grain size being from 60 to 90 nm.