

Method for growing solid solutions of the composition $\text{Ag}_{6.25}\text{P}_{0.75}\text{Sn}_{0.25}\text{S}_5\text{I}$ by directed crystallization from a melted solution includes the gradual heating of evacuated quartz ampoules containing pre-synthesized tetra iodide sulfides in a stoichiometric ratio at a rate of $100\text{ }^\circ\text{C}/\text{hour}$ to a temperature $50\text{ }^\circ\text{C}$ above the melting point, followed by retention at this temperature for 72 hours to homogenize the melt of the resulting charge and grow monocrystals at a rate of $0.4\text{--}0.5\text{ mm}/\text{hour}$. Quartz ampoules containing the previously synthesized tetra iodide sulfides $\text{Ag}_6\text{PS}_5\text{I}$ and $\text{Ag}_7\text{SnS}_5\text{I}$ are heated to $865\text{ }^\circ\text{C}$, and the monocrystals are subsequently grown in evacuated quartz ampoules by the method of directed crystallization from a melted solution at a melt zone temperature of $865\text{ }^\circ\text{C}$ for 48 hours and an annealing zone temperature of $525\text{ }^\circ\text{C}$, followed by annealing for 72 hours; the monocrystal is then cooled to room temperature at a rate of $5\text{ }^\circ\text{C}/\text{hour}$.