Invention relates to the field of inorganic chemistry and inorganic materials science, specifically to method for growing solid solution with the composition $Ag_{7,75}P_{0,25}Si_{0,75}S_6$. Method includes the stepwise heating of evacuated quartz ampoules containing previously synthesized ternary sulfides $Ag_7 PS_6$ and $Ag_8 SiS_6$, taken in a stoichiometric ratio, at a rate of 100 K/ hour to 1250 K and holding at this temperature for 72 hours to homogenize melt of resulting charge and grow single crystals at a rate of 0.4-0.5 mm/hour. Further single-crystal growth is carried out in evacuated quartz ampoules using the method of directed crystallization from melt-solution at a melt zone temperature of 1250 K for 48 hours and an annealing zone temperature of 875 K, followed by annealing for 72 hours. Single crystal is cooled to room temperature at a rate of 5 K/hour. Proposed method is convenient, fast, and can be carried out using standard equipment.