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Growth and characterization of $CH_3NH_3PbX_3$(X=I, Br) single crystals by solution method[1] SU JING, SANG LI, Nanjing University of Information Science & Technology, WANG DI, Nanjing University, LIN MIN, Nanjing University of Information Science & Technology — Solar energy conversion using solar cells requires materials that absorb in a broad spectral range, from visible to near infrared, to harvest most of the solar photons, as well as with the capability to convert effectively the incident light into free charges that produce electrical current and voltage. Organic-inorganic perovskite-structured hybrids $CH_3NH_3PbX_3$ (X = Cl, Br, I or a combination) exhibit good application potentials in the next generation solid-state solar cells. In order to improve the properties of $CH_3NH_3PbX_3$ based solar cell, the studies on the basic materials are of great necessities. In this work, we present the results of the successful growth of large single crystals of $CH_3NH_3PbI_3$ and $CH_3NH_3PbBr_3$ with size up to Cm's using hydrohalic acid solution method. The solubilities of $CH_3NH_3PbI_3$ and $CH_3NH_3PbBr_3$ in hydrohalic acid were determined by weight method at the temperature range between 300-360K. X-ray diffractometry, scanning electron microscopy were used to study the structure and morphology, and the lattice parameters were estimated using Rietveld refinement method. The study of crystal nucleation, morphology and dimensions indicates that these are strongly dependent on the supercooling state occurred to the liquid during crystal growth, in which the {100}always exhibits the largest faces on the as-grown crystals. Optical properties of these single crystals were characterized by FT-IR, Raman, photoluminescence and cathode fluorescent spectroscopy.

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