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High-pressure growth of SmFeAsO_{1-x} single crystals without fluorine doping HYUN-SOOK LEE, J.H. PARK, J.Y. LEE, HU-JONG LEE¹, Department of Physics, POSTECH, N.H. SUNG, J.Y. KIM, B.K. CHO, Materials Science and Engineering, GIST, T.Y. KOO, Pohang Accelerator Laboratory, C.U. JUNG, Department of Physics, Hankuk University of Foreign Studies — We synthesized fluorine-free SmFeAsO_{1-x} single crystals for a nominal value of $x=0.15$ at a pressure of 3.3 GPa and at a temperature of 1350-1450 °C by using a self-flux method. Plate-shaped single crystals were obtained with the lateral size of a few-150 μm . Single crystals showed the superconducting transition at about 53.5 K with a narrow resistive transition width of 0.5 K. The synchrotron-irradiated X-ray diffractometry (XRD) peaks and the high-resolution scanning transmission electron microscopy (HR-STEM) images indicate the good crystallinity of our single crystals, which have a well-defined layered tetragonal structure. The chemical composition of the crystals was examined with the electron-probe X-ray microanalysis. A sharp transition, a low residual resistivity, and a large residual resistivity ratio indicate high quality of our single crystals. Fluorine-free single crystals of Fe-based superconductors are expected to provide an easier route to find the optimum conditions for the crystal formation in this family of materials.

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