Synthesis of bulk FeTe1−x Se x (x = 0.1−0.5) at ambient pressure

ABSTRACT

In this study, polycrystalline samples with nominal composition FeTe1ī xSe x (x=0.1ī 0.5) were synthesized by solid-state reaction method at ambient pressure. In order to minimize oxidation, argon gas flow was maintained throughout the heat treatment. The phase formation of FeTe1ī xSe x samples was checked by X-ray diffraction (XRD). The polycrystalline FeTe1ī xSe x samples were indexed to a tetragonal structure with space group of P4/nmm. The lattice parameters a- and c-axes shrink significantly with the substitution of Se. As shown by the scanning electron microscope (SEM) images, the samples developed a plate-like grain structure gradually with the increase of Se concentration. Measurements of temperature dependence of magnetic moment showed that the onset of superconducting transition temperature, T c, increased with Se concentration. The T c is about 10.6 and 13.5 K for x= 0.1 and 0.5, respectively. All the samples exhibit ferromagnetic behavior as shown by the field-dependent magnetization measured at room temperature.

Keyword: Fe-based superconductor; Magnetic properties; Se substitution; Superconductivity