

Investigation of Niobium (Nb) Substitution on Structural and Superconducting Properties of (Bi, Pb)-Based Superconductors

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Abstract

In this study, the effects of Nb substitution on the Bi-based superconducting materials have been investigated. The X-ray diffraction measurement indicated coexistence of Bi-2212, Bi-2223 phases and some impurity phases of CuO, CuNb₂O₆, CaNb₂O₆, CaCuO₂, and Sr₂Nb₅O₁₆. With increasing Nb content, impurity phases consistent with the Nb element appeared in the samples. Also with increasing Nb content, the Bi-2223 phase of samples gradually was decreased and in contrast, the Bi-2212 phase was increased. From the SEM, results have been seen that with increasing of Nb contents, the crystal structure of the samples was slightly changed because of the disrupted grain growth. From the electrical resistivity measurements, it has been found that with increasing of Nb contents, critical temperature decreases and the superconducting transition width (ΔT) increases. Estimated critical current density showed that J_c decreases with increasing Nb content, as expected.

Keywords

H-T Superconductors, Bi-2223 Phase, Bi-2212 Phase, Bi-2201 Phase, X-Ray Diffraction