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Crystal growth and conduction properties of Pb substituted La(O,F)BiS₂

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La(O,F)BiS₂ is a layered superconductor, which have LaO as a blocking layer and BiS₂ as a conducting layer. Recently, an anomalous hump in temperature dependence of electric resistivity was reported in Pb substituted La(O,F)BiS₂ single crystal with Pb concentration 6~9%. [1] These specimens showed higher superconducting transition temperature (T_c) than specimens without the hump. The appearance of the hump is thought to be related to a structural change, though the origin has not been elucidated yet. We tried to synthesize La(O,F)BiS₂ single crystals which have Pb concentration much more than that in the samples previously studied to elucidate the effect of Pb substitution in La(O,F)BiS₂. We synthesized Pb substituted La(O,F)BiS₂ single crystal with Pb concentration up to 75% with flux method. We carried out structure analysis by X-ray diffraction and temperature dependence of the electric resistivity measurements to evaluate the conducting property of the samples. We found that the lattice constant along the c-axis shrank largely when Pb concentration exceeded 10%, indicating possible structural change. In these samples, the superconductivity was suppressed and no T_c was observed down to 2 K. In the presentation, we also discuss the results of Seebeck coefficient measurements of these samples to investigate the electronic structure.

[1] S. Otsuki, et al. Solid State Communications 270 (2018) 17-21

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