

PCP6-7

Superconductivity in the heavily Pb-doped Bi-2212 phase of $(\text{Bi,Pb})_2\text{Sr}_2\text{CaCu}_2\text{O}_{8-\delta}$

*Koki Takano¹, Ryohei Ito¹, Takayuki Kawamata¹, Takashi Noji¹, Masatsune Kato¹

Department of Applied Physics, Tohoku University, Japan¹

The superconducting transition temperature T_c of the Bi-2212 phase of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ is ~ 80 K. The reason of the relatively low T_c is that the hole-concentration is situated in the overdoped region because extra oxygen atoms easily introduced in the BiO plane supply the CuO_2 plane with holes excessively. The structural disorder caused by extra oxygen atoms also suppresses superconductivity. Recently, we have succeeded in increasing T_c up to 102 K in $\text{Bi}_{1.64}\text{Pb}_{0.36}\text{Sr}_2\text{CaCu}_2\text{O}_8$ by the optimization of the content of Pb^{2+} -substitution for Bi^{3+} and the complete removal of extra oxygen atoms through the reduction annealing [1]. With further increasing Pb-content, it is expected that the oxygen deficiency occurs. In this study, we have investigated the effects of the oxygen deficiency on T_c in the heavily Pb-doped Bi-2212 phase of $(\text{Bi,Pb})_2\text{Sr}_2\text{CaCu}_2\text{O}_{8-\delta}$.

Polycrystalline samples of $\text{Bi}_{2-x}\text{Pb}_x\text{Sr}_2\text{CaCu}_2\text{O}_{8-\delta}$ ($0 \leq x(\text{Pb}) \leq 1$) were prepared by the solid-state reaction method and annealed in flowing gas of Ar in the final step to suppress the formation of impurity phases with Pb^{4+} . As shown in Fig. 1, almost single-phase samples can be obtained for $x(\text{Pb}) \leq 0.6$ through the Ar-annealing at 710-750°C. As for $x(\text{Pb}) = 0.8$, almost single-phase sample is obtained through the Ar-annealing at 730°C. We will report the effects of the oxygen deficiency on T_c .

[1] K. Sugawara *et al.*, J. Phys.: Conf. Ser. **1054** (2018) 012008.

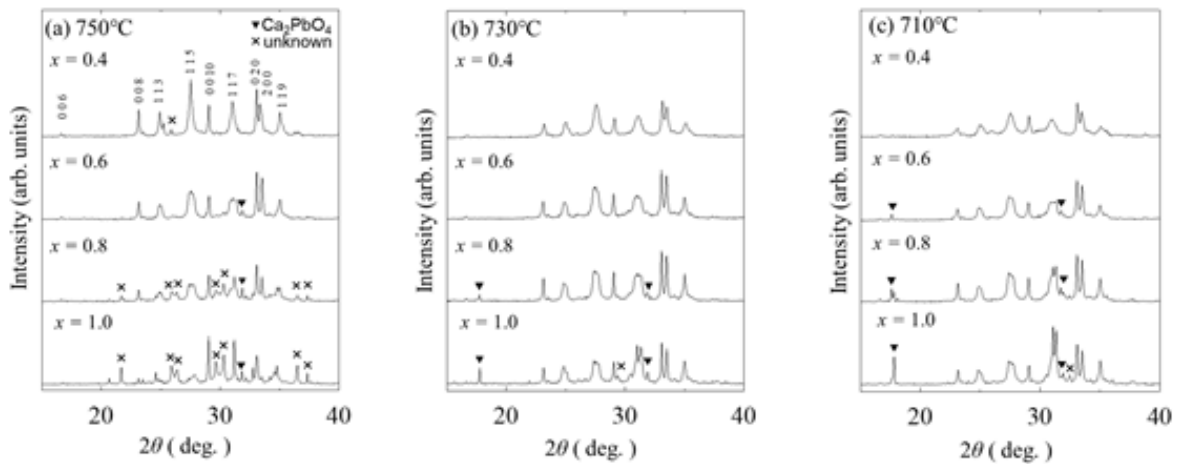


Fig.1. Powder X-ray diffraction patterns of $\text{Bi}_{2-x}\text{Pb}_x\text{Sr}_2\text{CaCu}_2\text{O}_8$ ($0.4 \leq x(\text{Pb}) \leq 1$) obtained after the Ar-annealing at (a)750°C, (b)730°C and (c)710°C.

Keywords: Bi-2212, Pb-substitution, Oxygen deficiency