

## A New Aspect of Single Layered Cuprate Superconductors - 90 K Superconductors for Ca-Doped $\text{Bi}_2\text{Sr}_2\text{CuO}_{6+\delta}$ Single Crystals

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We have succeeded in synthesizing single crystals of  $\text{Bi}_{2+x}\text{Sr}_{2-x-y}\text{Ca}_y\text{CuO}_{6+\delta}$  which exhibits 90 K-class superconductivity. Crystals are prepared for various values of  $(x, y)$  in the range of  $x=0.1-0.22$  and  $y=0.4-0.6$  by a floating-zone method. The X-ray diffraction pattern of a single crystal ensures the  $c$ -axis length of 2.4 nm, which indicates that the crystal belongs to the Bi-2201 phase. This crystal with the nominal value of  $(x, y)=(0.15, 0.4)$  shows the onset temperature of superconducting transition at 91.6 K in low-field dc-magnetic measurement.

The Ca substitution for Sr in  $\text{Bi}_2\text{Sr}_2\text{CuO}_{6+\delta}$  will not affect the carrier density because of the isovalency of the elements. The crystal symmetry and the modulation structure along the  $b$ -axis have also been influenced little by the Ca doping. However, the  $T_c$  has changed almost doubled value compared to the maximum  $T_c$  for the La and Pb co-doped  $\text{Bi}_2\text{Sr}_2\text{CuO}_{6+\delta}$  crystals ( $T_c=43$  K)<sup>1</sup>. Thus this implies that the present system may be a good candidate to study the origin of the high- $T_c$  superconductivity. A tentative analysis suggests the important role of the apical oxygen.

<sup>1</sup>Arao *et al.*, Physica C **445-448**, 440 (2006).