

## Indications of superconductivity in the 200–300 K range in the Bi-Ca-Sr-Cu-O system\*

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**Abstract.** Some of the Bi-Ca-Sr-Cu-O compositions show indications of onset of superconductivity in the 200–300 K region, possibly due to the intergrowth of different layered sequences.

**Keywords.** High-temperature superconductivity; Bi-Ca-Sr-Cu-O system.

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In our recent communication on the high-temperature superconductivity in oxides of the Bi-Ca-Sr-Cu-O system (Rao *et al* 1988), we reported the occurrence of resistivity drops around 200 K in some of the samples. We felt that these may signify the presence of a small proportion of superconducting phases with  $T_c$ s around 200 K, possibly caused by the intergrowth of different layered sequences. Part of the reason for this hunch was based on our observation that  $\text{Bi}_2\text{CaSrCuO}_{6+\delta}$  and  $\text{Bi}_2\text{Ca}_{1.5}\text{Sr}_{1.5}\text{CuO}_{8+\delta}$  show onset of superconductivity around 85 and 100 K (with zero-resistance at 25 and 45 K) respectively; similarly, the  $T_c$  of the 2223 member of the Tl-Ca-Ba-Cu system seems to be higher than that of the 2122 member, suggesting that  $T_c$  increases with the number of  $\text{CuO}_2$  layers. We therefore made up several Ba-Ca-Sr-Cu-O compositions corresponding to (1:1) intergrowth of two different phases (Rao 1985) and measured their resistivity. All of them indeed showed drops in resistivity around 200 K (figure 1). Onset of diamagnetic susceptibility was also seen around this temperature (figure 1). The resistivity drop around 200 K is more marked than that observed by Chu *et al* (1988) for the 110 K Bi-Ca-Sr-Cu-O phase. Some of these intergrowth compositions gave lattice images with considerable disorder and showed co-existence of fringes corresponding to different  $c$ -parameters (figure 2). It seems that intergrowth of different layered sequences may provide a means of increasing  $T_c$ .

Encouraged by the likely presence of a 200 K superconducting phase, we carried out electrical and magnetic measurements on different compositions of the Bi-Ca-Sr-Cu-O system. The composition  $\text{Bi}_{2.25}\text{Ca}_{1.2}\text{Sr}_{1.55}\text{Cu}_2\text{O}_x$  showed onset of diamagnetism and a resistivity drop around 280 K (figure 3). This composition, although corresponding to a

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