

Thesis Title Preparation and Characterization of $\text{Bi}_2\text{CaSr}_2\text{Cu}_2\text{O}_{9-x}$
 Superconductor

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M.S. Chemistry

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Abstract

Samples of Bi-Ca-Sr-Cu-O were prepared by two methods, namely solid-state reaction and coprecipitation. In the solid-state reaction method, Bi_2O_3 , CaCO_3 , SrCO_3 and CuO were mixed and ground together thoroughly, then calcined at 800°C for 12 hours and later pressed into pellets. Each pellet sample was sintered at 879°C for 25-30 minutes then at 850°C for 4-8 days, and finally at 860°C for 2 days. The sintered sample was quenched rapidly in liquid nitrogen. Preparation by the coprecipitation method was carried out using nitrate solutions of bismuth, calcium, strontium and copper as starting materials

with oxalic acid added as a precipitant. The most suitable pH for coprecipitation was 2. The precipitate was calcined at 550°C for 12 hours and heated to a temperature of 830°C. The temperature was then adjusted to 800°C and heating continued for a further 12 hours. Each pellet sample obtained by this method sintered at various temperatures ranging from 850- 870°C for different times depending upon the sample. Rapid quenching of the sample was carried out using liquid nitrogen.

The T_c zero for both types of samples, solid-state reaction and coprecipitation, were determined by a Four-Point-Probe technique and found to be 86 K and 88 K respectively. X-ray powder diffraction showed the lattice parameters to be $a = 5.41 \text{ \AA}$ $b = 27.23 \text{ \AA}$ $c = 30.95 \text{ \AA}$ for the solid-state reaction sample and $a = 5.31 \text{ \AA}$ $b = 28.25 \text{ \AA}$ $c = 30.52 \text{ \AA}$ for the coprecipitation sample. From these parameters, it is considered that the crystal structures of the samples are all orthorhombic perovskite.

Bismuth contents were determined by a gravimetric method, while those of calcium, strontium and copper were determined by atomic absorption spectroscopy. The results indicated a composition of $\text{Bi}_{1.92} \text{Ca}_{1.00} \text{Sr}_{1.58} \text{Cu}_{1.83}$ for the solid-state reaction samples and $\text{Bi}_{2.10} \text{Ca}_{1.00} \text{Sr}_{1.90} \text{Cu}_{1.90}$ for those from coprecipitation.