FABRICATION AND CHARACTERISATION OF $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_y$ SUPERCONDUCTORS PREPARED BY SOLID STATE REACTION TECHNIQUE

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ABSTRACT

Three Bismuth based superconducting samples with the composition $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_y$ were prepared using solid state technique. The Bi_2O_3, PbO, $SrCO_3$ and CuO powders of 99.99% purity were used as starting raw materials. The powders were mixed with the nominal cation ratio Bi:Pb:Sr:Ca:Cu = 0.8:0.2:1:1:1.5 and the mixed well using dry grinding. Then the powder was divided into three sets and with the labels Sample1, Sample2 and Sample3. Then the samples were calcinated at constant temperature of 820^0C and the pallets of diameter 14 mm and of thickness 1-2 mm were prepared under the pressure of 200 kg/cm^2, 300 kg/cm^2 and 250 kg/cm^2. After that the pallets were subjected to preliminary sintering at constant temperature in the furnace and allowed to furnace cooling to room temperature in air.

The resistance measurements at low temperatures were performed on these samples using a resistivity probe. The sample1 shows the onset superconducting transition temperature T_{onset} at 103 K and 101 K, when cooling and heating respectively. The sample2 shows the onset superconducting transition temperature T_{onset} at 111 K and 112 K, when cooling and heating respectively. The sample3 shows the onset superconducting transition temperature T_{onset} at 110 K and 110 K, when cooling and heating respectively. The XRD measurements were also performed and conclude that the samples consists Bi2223 phases.