EFFECT OF NANO PARTICLE CaO ADDITION (1-5WT%) ON SUPERCONDUCTIVITY PROPERTIES OF (Bi-Pb) 2223 SUPERCONDUCTOR WITH COPRECIPITATION METHOD

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ABSTRACT

EFFECT OF NANO PARTICLE CaO ADDITION (1-5 WT%) ON SUPERCONDUCTIVITY PROPERTIES OF (Bi-Pb) 2223 SUPERCONDUCTOR WITH COPRECIPITATION METHOD

The effect of nano particle CaO addition on the critical temperature (T_c) of BSCCO system with nominal starting composition of $Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_{10-x}$ (Bi-2223) was studied. The $(Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_{10})_{-x}$ (Bi-2223) superconductor with addition of nano CaO (1-5wt %) particle have been prepared using the coprecipitation (COP) technique. The $(Bi_{1.6}Pb_{0.4}Sr_2Ca_2Cu_3O_{10})_{-x}$ samples have been investigated by dc electrical resistance, for measuring critical temperature (T_c).The dominance of high- T_c was observed for all samples as evidenced in the single step transition of (*R-T*) curves. The results show that the addition of nano CaO particle does not affect much on the T_c zero of the added sample. T_c zero for non added sample was obtained around 97 K whereas for samples with 1-5wt% addition showed T_c zero in the range of 86-73 K. Resistivity versus temperature measurement (*R-T*) showed that all samples exhibited metallic behaviour. This behaviour resulted in the shifting of $T_{c\ zero}$ toward lower temperature. A linear decrease in T_c with increase in the level concentration of nano Cao addition was observed. However, the COP samples showed better superconducting properties probably due to higher homogeneity resulted from mixing of sub-micron particles during sintering. In conclusion, the finding of this study reveals using COP method has some potential in high temperature superconductor compared with solid state method.

CHAPTER 1

INTRODUCTION

1.1 Background

Superconductors are known as solid materials that have zero resistance to the flow of electricity below a certain temperature. There were two types of superconductors. The first one is Type 1 category or "soft" superconductors which required coldest temperature to become superconductive. This type of superconductors comprised of metals and metalloids whereas Type 2 or "hard" superconductors comprised of metallic compounds and alloys. The phenomenon occurring in certain materials at low temperatures with zero electrical resistance and exclusion of interior magnetic fields is known as superconductivity.

Contrast with normal conductors' situation, where in normal conductor exists a phenomenon known as electrical resistance in which energy carried by current is constantly being dissipated but not in superconductor where there are zero electrical resistance and no dissipation energy occur.

In addition, based on the concept of zero electrical resistance, superconductors are widely used in technological area. For example, application of superconductor properties in Magnetic Resonance Imaging (MRI), MAGLEV train and some other high T_c superconductor (HTS) conductors.