

EFFECT OF Zr ADDITION ON $\text{Bi}_{1.6}\text{Pb}_{0.4}\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_\delta$ SUPERCONDUCTOR

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ABSTRACT

The effect of Zr doping on 2223 phase of BSCCO system with general formula of $\text{Bi}_{1.6}\text{Pb}_{0.4}\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_\delta\text{Zr}_x$ has been studied via XRD and resistance measurement to determine its crystalline structure and critical temperature, T_C respectively. All samples were prepared using conventional solid state reaction technique that involved a series of mixing and grinding. Generally, all samples exhibit metallic behaviour above T_C onset ($>108\text{K}$ except in $x = 0.2$ where T_C onset $\sim 80\text{K}$). A single-step features was observed in all samples except in $x = 0.15$ and $x = 0.2$. The zero resistance temperature, $T_C(R=0)$ decreased as the content of Zr was increased with the Zr-free recorded the highest value at 100 K while the lowest $T_C(R=0)$ was recorded in $x = 0.2$ with 56 K. The ZrO_2 was incorporated into the crystalline structure of BSCCO system in all samples except for $x = 0.15$ and $x = 0.2$. A few peaks of ZrO_2 were detected in the samples. The volume for fraction of 2223:2212 in samples $x = 0.00 - x = 0.10$ is approximately 74:26 but drastically decreased to 38:72 in $x = 0.15$ and $x = 0.20$. The crystallographic structure remains in tetragonal form where $a = b \neq c$. The c-lattice that plays an important role of superconducting properties was not significantly affected by the Zr addition up to $x = 0.10$. However the c-lattice decreased in other samples.

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