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

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ABSTRACT
The effect of Zr doping on 2223 phase of BSCCO system with general formula of Bi$_{1.6}$Pb$_{0.4}$Sr$_2$Ca$_2$Cu$_3$O$_{δ}$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 (>108K except in $x=0.2$ where T$_C$ onset ~ 80K). 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 $a=b ≠ c$. 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.


REFERENCES