Microstructural Investigation of Ag-added $BaFe_{1.84}Co_{0.16}As_2$ Bulk Superconductor

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$BaFe_2As_2$ (Ba122) belongs to the family of 122-type superconductors. This material possesses high critical current density (J_c) up to ~10^6 A/cm^2 in single crystal and high upper critical field (H_{c2}) more than 50 T, hence it is immensely anticipated for high magnetic field applications [1]. To achieve the practical applications, the J_c of polycrystalline Ba122 needs to be further escalated.

Chemical addition is proven to have positive impact on the superconducting properties by catalyzing intergranular coupling, modifying grain dimension, and promoting crystallization. In this study, we identify the influence of silver in the microstructure of $BaFe_{1.84}Co_{0.16}As_2$. The powder precursors were prepared by high-energy ball-milling [3] of elemental metals and heat treatment was subsequently performed under vacuum for 48 hours with four temperature variations between 600ºC – 900ºC. 5wt% of Ag was added before heat treatment.

SEM observation discloses progressive densification with less voids along with increasing temperature which confirms density enhancement. EDX analysis indicates that Ag is uniformly distributed over the bulk with several Ag particles clearly distinguished from the Ba122 phase (shown as bright spots in Fig. 1). Gradual agglomeration also occurs in the bulk as temperature rises. This result agrees with prior studies in which Pb particles reside between grains in $Sr_{0.6}K_{0.4}Fe_2As_2$ [2].

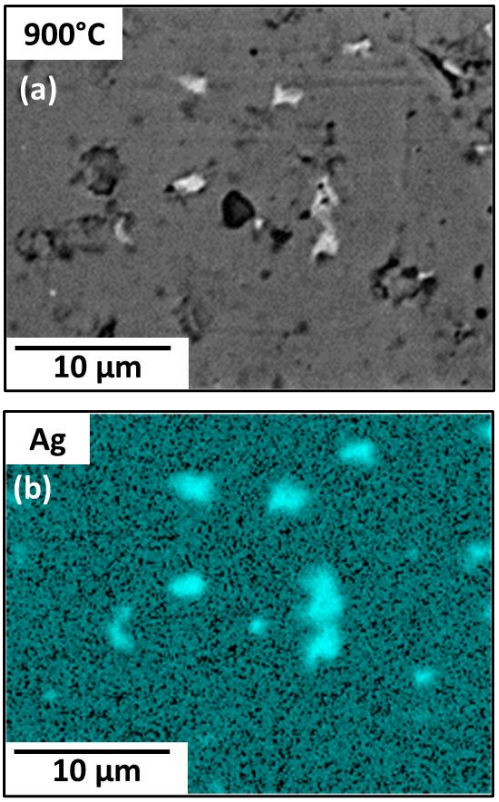

Fig. 1 SEM-EDX analysis of (a) sample at 900ºC and (b) Ag distribution map at 900ºC.

References

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