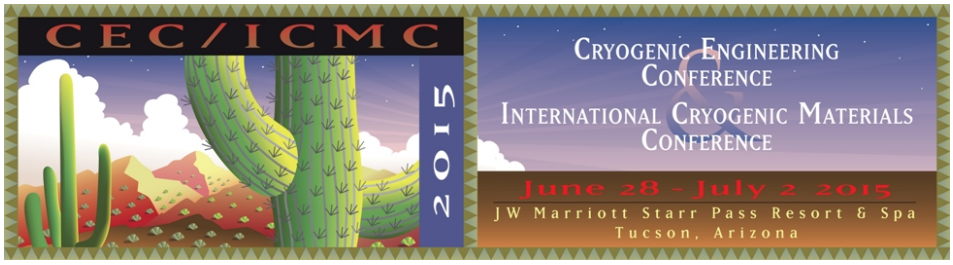

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Synthesis of Bi2Sr2CaCu2Ox oxide precursor from nano-oxides and its relationship with multifilamentary wire transport properties

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Bi2Sr2CaCu2Ox (Bi2212)/Ag multifilamentary wires are manufactured via the powder-in-tube process using oxide powders. The properties of the precursor powders, including stoichiometry, purity, grain size and morphology, packing density and phase assembly, have significant impact on wire properties after heat treatment. Most research has focused on the processing of wire after deformation due to limited control of the precursor powders, resulting in several challenging, unsolved problems. In particular, inconsistency in stoichiometry, content of carbon residue and Bi2Sr2CuOy (Bi2201) impurity of the precursor powders limit wire transport. Here, nanosize oxides produced by NanoSpray CombustionTM (nGimat, LLC) are used as starting materials to synthesize Bi2212 oxide precursors via solid-state calcination. After calcination, high purity Bi2212 powders with controllable stoichiometries, ultra-low carbon content and absence of Bi2201 are produced. In our study, properties of nanosize oxides, general trend of processing parameters of Bi2212 precursor powders and their influence on precursor properties including stoichiometry, phase transformation, carbon content, grain size and morphology are discussed. Furthermore, multifilamentary round wires are made from these powders, melt processed and analyzed. Results of transport property, magnetic property, microstructures and phase assemblage correlated to precursor properties are reported.

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