Study of Ag:$(Bi,Pb)_2Sr_2Ca_2Cu_3O_x$ Composite Precursor Powders Obtained by Spray Pyrolysis

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The preparation of a high quality precursor powder is the first critical step for the development of high-temperature superconducting devices based on tapes, films, foams and bulk materials. Precursor powders used for oxide-powder-in-tube preparation of Bi-2223/Ag tapes have to be partially reacted, i.e, must contain a mixture of Bi-2212 phase with some secondary phases, to promote high critical current densities. Aerosol decomposition of dissolved metal salts may result in a such phase assemblage, propitious for Bi-2223 conversion in further firing treatments. Aerosol decomposition approach also results in chemically homogeneous and uniform submicron particles. These powder characteristics lead to acceleration of Bi-2223 phase conversion and are also beneficial to the resulting superconducting properties of the converted Bi-2223 phase.

The development of Ag:BPSCCO composite powders by aerosol decomposition route has both practical and academic relevance. Ag:BPSCCO composite powders, with homogeneous distribution of fine-grained Ag particles, used as precursor for the partial-melting manufacture of Bi-2212 blocks and films, should have a beneficial effect on the oxygen distribution of the Bi-2212 phase formed during partial-melting route. Also, it is known, from precursor powders prepared by solid-state reaction route, that the interaction of Ag with the BPSCCO system can enhance the kinetics of (Bi,Pb)-2223 phase formation,.

The aim of the present investigation is to establish an aerosol decomposition process for fine Ag:BPSCCO composite powder synthesis and to study its phase assemblage and particle morphology after spray pyrolysis process, as well as, after initial thermal treatment. XRD and magnetic susceptibility measurements were used to follow phase assemblage evolution. Particle morphology was investigated by TEM. The final conversion step of Ag:BPSCCO composite powder to Ag:(Bi,Pb)-2223 powder was studied by DTA.