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KINETICS AND THERMODYNAMICS OF CERAMIC/METAL INTERFACE REACTIONS RELATED TO HIGH T_c SUPERCONDUCTING APPLICATIONS

Michael R. Notis and Min-Seok Oh, Lehigh University, Department of Materials Science and Engineering, 452 Whitaker Lab #5, Bethlehem, PA 18015

Superconducting ceramic materials, no matter what their form, size or shape, must eventually make contact with non-superconducting materials in order to accomplish current transfer to other parts of a real operating system, or for testing and measurement of properties. Thus, whether the configuration is a clad wire, a bulk superconducting disc, tape, or a thick or thin superconducting film on a substrate, the physical and mechanical behavior of interface (interconnections, joints, etc.) between superconductors and normal conductor materials of all kinds is of extreme importance to the technological development of these systems. Fabrication heat treatments associated with the particular joining process allow possible reactions between the superconducting ceramic and the contact to occur, and consequently influence properties at the interface region. The nature of these reactions is therefore of great broad interest, as these may be a primary determinant for the real capability of these materials.

In this paper we describe our own research related both to fabrication of composite sheathed wire products, and the joining contacts for physical property measurements, as well as a review of other related literature in the field. Comparison will be made between "1-2-3," Bi-, and Tl-based ceramic superconductors joined to a variety of metals including Cu, Ni, Fe, Cr, Ag, Ag-Pd, Au, In and Ga. The morphology of reaction products and the nature of interface degradation as a function of time will be highlighted.