STRATEGIC RESEARCH AT ORNL FOR THE DEVELOPMENT OF ADVANCED COATED CONDUCTORS: PART - I

D.K. Christen, C. Cantoni, R. Feenstra, T. Aytug, M. Parans Paranthaman, L. Heatherly, M. M. Kowalewski, F. A. List, A. Goyal, G. W. Ownby, D. M. Zehner, A. Goyal, and D.M. Kroeger
Oak Ridge National Laboratory, Oak Ridge, TN 37831-6061, USA

ABSTRACT

In the RABiTS approach to coated conductor development, successful (both economic and technological) depends on the refinement and optimization of each of three important components: the metal tape substrate, the buffer layer(s), and the HTS layer. Here we will report on the ORNL approach and progress in each of these areas.

- Most applications will require metal tapes with low magnetic hysteresis, mechanical strength, and excellent crystalline texture. Some of these requirements are competing. We report on progress in obtaining a good combination of these characteristics on metal alloys of Ni-Cr and Ni-W.
- The deposition of appropriate buffer layers is a crucial step. Recently, base research has shown that the presence of a stable sulfur superstructure present on the metal surface is needed for the nucleation and epitaxial growth of vapor-deposited seed buffer layers such as YSZ, CeO_2 and $SrTiO_3$. We report on the details and control of this superstructure for nickel tapes, as well as recent results for Cu and Ni-13%Cr.
- Processes for deposition of the HTS coating must economically provide large values of the figure-of-merit for conductors, current x length. At ORNL, we have devoted efforts to a precursor/post-annealing approach to YBCO coatings, for which the deposition and reaction steps are separate. We describe motivation for and progress toward developing this approach.
- Finally, we address some issues for the implementation of coated conductors in real applications, including the need for texture control and electrical stabilization of the HTS coating.