Crystal Chemistry and Crystallography of the $Ba_2RCu_3O_{6+x}$ - $SrTiO_3$ System

Winnie Wong-Ng[a], Zhi Yang[a], James Kaduk[b], Qing Huang[a], Lawrence Cook[a], [a]*Materials Science and Engineering Laboratory, NIST, Gaithersburg, MD*. [b]*BP-Amoco, Naperville, IL, USA*. E-mail: winnie.wong-ng@nist.gov

Continued world-wide research in high T_c superconductors has lead to the promise of a wide variety of industrial applications. To implement these applications, the availability of low-cost, long-length, and high performance superconductor wire/tape and cable is critical. Preparation of these wires/tapes involve deposition of $Ba_2RCu_3O_{6+x}$ (R-213, R=lanthanides and Y) films on biaxially-textured buffer/substrates. Two promising processes for preparing buffer/substrates are the Ion Beam Assisted Deposition (IBAD) and the Rolling Assisted Biaxially Textured Substrates Buffer (RABiTS). For a given combination of buffer layers that has been found to promote epitaxial growth of $Ba_2RCu_3O_{6+x}$, there may be unavoidable reactions at the interface between layers. Understanding of interfacial reactions of R-213 phase with the buffer layers will provide information about how to avoid and/or control the formation of second phases. Crystallographic and phase equilibrium data will assist analysis of coated conductor interfaces. This paper describes the crystal chemistry and crystallography of the multi-component systems representing the interaction of $Ba_2RCu_3O_{6+x}$ with the al, $SrTiO_3$ buffer. X-ray and neutron Rietveld refinements were employed for structural studies. Examples of phases that will be discussed include $(Ba,Sr)_3RTi_2O_{8.5}$, $(Ba,Sr)R_2CuO_5$, $(Ba,Sr)Ti_2O_4$, and $(Ba,Sr)_2RCu_3O_{6+x}$, etc.

Keywords: superconductor substrate interface, $Ba_2RCu_3O_{6+x}$-$SrTiO_3$, coated conductors