HIGH TEMPERATURE X-RAY STUDY OF PHASE EVOLUTION AND TEXTURE OF $Ba_2YCu_3O_{6+X}$ FILMS USING THE BaF_2 PROCESS

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The rapid pace of high T_c superconductor research continues to be driven by the promise of a wide variety of industrial applications, including power distribution, energy storage, and advanced motors and magnets. The key to implementing these applications is the availability of low-cost, long-length, and high performance wire/tape and cable.

Epitaxially grown superconductor films are critical for producing high critical current density. The "BaF_2 *ex-situ* process" using e-beam co-evaporated BaF_2-Y-Cu-precursor films on rolling-assisted biaxially textured metal substrates (RABiTS), followed by post-annealing in the presence of H_2O vapor, has demonstrated the potential for producing high quality, long-length $Ba_2YCu_3O_x$ (Y-213) superconductors. Phase evolution of the Y-213 phase in the multi-component Ba-Y-Cu-F-OH system which is related to the resulting textured film is not completely understood, however. High-temperature x-ray diffraction (HTXRD) experiments can provide critical information on phase evolution of Y-213 during the BaF_2 process, and have been conducted on amorphous precursor BaF_2-Y-Cu films and films of the subsystems prepared at the Oak Ridge National Laboratory. These films were prepared using a three-source e-beam evaporation technique. A theta-theta geometry Siemens 5000 x-ray powder diffractometer equipped with a furnace, a custom-designed vacuum and gas flow system was used for film characterization. We have followed the phase formation of various phases in the pseudo-binary subsystems (i.e., BaF_2-Y_2O_3, BaF_2-CuO_x, and Y_2O_3- CuO_x), and alsoY-213 in the BaF_2-Y-Cu (-O) films from amorphous precursor films in the presence of H_2O vapor. Texture analysis was accomplished using the Œomega-scan, procedure. Our current understanding of the phase evolution mechanism of Y-213 from amorphous precursor films will be discussed.

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