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

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The potential for a wide variety of industrial applications, including power distribution, energy storage, and advanced motors and magnets, provides the motivation for the continued rapid pace of high T_c superconductor research activity. Key to implementing these applications is the availability of low-cost, long-length, and high performance wire/tape and cable.

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. The phase evolution of the Y-213 phase in the multi-component Ba-Y-Cu-F-OH system, however, is not completely understood. 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 prepared at the Oak Ridge National Laboratory. The 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 this study. We have demonstrated the feasibility of following the phase formation of Y-213 and decomposition of BaF_2 from amorphous precursor films in the presence of H_2O vapor. Texture analysis was accomplished using the 'omega-scan' procedure. Recent development of our HTXRD system involved the installation of a position sensitive detector and new instrument control (LabVIEW). The availability of these enhancements will allow us to obtain the phase evolution mechanism of Y-213.

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