

Growth Properties of Textured Buffer Layers on Metal Substrates by R. F. Multi-turn Sputtering

K. C. Chung^a, J. M. Yoo^a, Y. K. Kim^a, X. L. Wang^b, S. X. Dou^b

^a*Korea Institute of Materials Science, Changwon, Korea*

^b*Institute for Superconducting and Electric materials, Univ. of Wollongong, Wollongong NSW2522, Australia*

All three buffer layers of CeO₂, yttria-stabilized ZrO₂(YSZ), and Y₂O₃ have been deposited on biaxially textured metal substrates using R. F. sputtering. The first 50-70nm thick Y₂O₃ films were grown epitaxially on biaxially textured metal substrates as a seed layer and followed by the diffusion barrier ~100nm thick YSZ and capping layer ~200nm thick CeO₂ deposited epitaxially on top of Y₂O₃ seed layers. The epitaxial orientation of all three layers were all (100) grown with rocking curve FWHM of 4-5° and in plane phi-scan FWHM of 6-10° using X-ray diffraction. The NiO phase formed during the Y₂O₃ deposition seems to degrade the crystallinity and roughen the surface morphology of the following layers observed by FE-SEM. The buffered tape was used as substrates for long length YBCO coated conductors with high critical current density J_c. The five multi-turn of metal tapes was employed to increase the thickness of films and production rate to compensate the low growth rate of R. F. sputtering method. To investigate the reaction of buffer layers with deposited MOD-YBCO superconducting layer, the Secondary Ion Mass Spectroscopy(SIMS) was used to qualify the diffusion properties of buffer layers.

Keywords: R. F. Sputtering, YBCO, Buffer layer

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