YBCO Superconductors on Electrodeposited Biaxially Textured Buffer Layers

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Abstract—Non-vacuum electrodeposition (ED) was used to prepare simplified $Gd_2O_3/Gd_2Zr_2O_7$ and $CeO_2/Gd_2Zr_2O_7$ buffer layers on a Ni-W substrate. Post-annealing conditions of electrodeposited precursor films were optimized to obtain high-quality biaxially textured buffer layers. The buffer layers were characterized by X-ray diffraction, optical profiling, and transmission electron microscopy. The effect of the cap layer thickness on the surface morphology and texture of the buffers was also studied. The microstructure of $CeO_2/Gd_2Zr_2O_7$ was analyzed and compared to $Gd_2O_3/Gd_2Zr_2O_7$. $YBa_2Cu_3O_{7-\delta}$ (YBCO) superconductor was deposited by pulsed laser deposition (PLD) on the simplified ED-$Gd_2O_3/Gd_2Zr_2O_7$ and ED-$CeO_2/Gd_2Zr_2O_7$ buffers. Transport current density of 3.3 MA/cm^2 was obtained for PLD YBCO deposited on ED-$Gd_2O_3/Gd_2Zr_2O_7$ buffer layers.

Index Terms — Biaxial texture, buffer layers, electrodeposition, pulsed laser deposition, YBCO.

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