Electrodeposited Biaxially Textured Ni, Ni-W Layer for YBCO Superconductor Oxide Films

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Nonvacuum electrodeposition was used to prepare biaxially textured Ni, Ni-W coatings on Ni-W and Cu substrates, respectively. The samples were characterized by X-ray diffraction (XRD) (including θ/2θ, pole figures, omega scans, and phi scans), and atomic force microscopy. Pole-figure scans show that electrodeposited (ED) Ni on textured Ni-W (3 at. %) is 99.3% cube textured. Full-width at half-maximum values of the ω scan and ϕ scan of the electrodeposited Ni layers were comparable to the Ni-W base substrates, indicating good biaxial texturing. The buffer structures were completed on these types of seed ED-Ni layers by pulsed-laser-deposited (PLD) CeO_2/YSZ/CeO_2. We obtained a critical current density of 1.8 MA/cm^2 at 75.2 K in 600 Gauss magnetic field for PLD $YBa_2Cu_3O_{7-\delta}$ /CeO_2/YSZ/ CeO_2/ED-Ni/Ni-W. We demonstrated that good-quality biaxially textured Ni, Ni-W could be prepared by potentially low-cost, nonvacuum electrodeposition. We also demonstrated superconducting properties comparable to, or better than, the reported literature value of YBCO on ED-Ni/Ni-W-based substrates.