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Title: Current Progress in YBCO Coated Conductors Using IBAD
MgO Template Layers

Author(s): J.Randy Groves, Paul N. Arendt, Steve R. Foltyn, Quanxi X.
Jia, MST-STC, Terry G. Holesinger, MST-6, Luke A.
Emmert, Raymond F. DePaula, Paul C. Dowden, Liliana
Stan, MST-STC

Rhett T. Brewer and Harry Atwater, California Institute of
Technology, Pasadena, CA

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Current progress in YBCO coated conductors using IBAD MgO template layers

J.R. Groves, P.N. Arendt, S.R. Foltyn, Q.X. Jia, T.G. Holesinger, L.A. Emmert, R.F. DePaula, P.C. Dowden, L. Stan
Superconductivity Technology Center, Los Alamos, New Mexico, 87545

Rhett T. Brewer and Harry A. Atwater
California Institute of Technology, Pasadena, California, 91125

We present key improvements to growing high quality ($\sim 7^\circ \Delta\phi$) magnesium oxide (MgO) films. The use of a new layer for IBAD MgO nucleation and reduction in surface roughness of substrates have resulted in better in-plane texture. The processing window for obtaining optimum template texture is very narrow (~ 10 seconds) using Si_3N_4 . This has been ameliorated by use of an alternate amorphous nucleation layer. The substrate surface roughness has a significant effect on the initial nucleation texture of IBAD MgO films. A surface roughness of ~ 1 nm has resulted in better in-plane texture for IBAD MgO films deposited on metal substrates. We have also implemented a method to quantify IBAD MgO texture using reflected high-energy electron diffraction (RHEED). Utilizing this in situ tool, we have been able to refine deposition parameters to routinely grow films in batch mode that have a $\Delta\phi$ of $\sim 7^\circ$. Deposited meter lengths have had $\Delta\phi$ values from $7-9^\circ$ with 10% uniformity. One to two micrometer thick YBCO films on these templates have had critical current densities in excess of 1 MA/cm^2 at 75 K, in self field.