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

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## Current progress in YBCO coated conductors using IBAD MgO template layers

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We present key improvements to growing high quality ( $\sim 7^\circ \Delta\phi$ ) magnesium oxide (MgO). 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 ( $\sim 10$  seconds) using  $\text{Si}_3\text{N}_4$ . 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  $\sim 1$  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  $1 \text{ MA/cm}^2$  at  $75 \text{ K}$ , in self field.