

Delamination of Buffer Layer From Metal Substrate for Coated Conductor

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Delamination of oxide buffer layers from metal substrate for coated conductor was investigated. The change of grain size, formation of carbide phases, and selective oxidation of metallic elements at the surface of substrate (Hastelloy C 276) and partial (or localized) crystallization in amorphous layer such as Al_2O_3 and Y_2O_3 were carefully modified and observed to understand the mechanism of delamination. Two samples, one buffered metal substrate with the architecture of LMO/Epi-MgO/IBAD-MgO/ Y_2O_3 / Al_2O_3 /Hastelloy C276 and bare Hastelloy C276 metal specimens were heat treated at the temperatures of 7000~900°C in oxygen atmosphere, which is simulating the deposition conditions of oxide superconducting layer. The Hastelloy C276 specimen showed the increase of grain size, number of carbide and oxide phases near the surface. The XRD results for buffered Hastelloy C276 specimen showed no evidence for localized crystallization in amorphous layers of Al_2O_3 and Y_2O_3 . Also, there are no peaks from other oxide such as Cr_2O_3 or Mo_2O_3 etc, which means the layers of LMO/Epi-MgO/IBAD-MgO/ Y_2O_3 / Al_2O_3 are sufficient for protecting the Hastelloy C276 from oxidation during YBCO deposition. Therefore the formation of carbide phase and the grain growth might be the major reason for delamination of buffer layer. The detail mechanism of delamination and the possible remedies will be discussed.

Keywords : coated conductor, delamination, carbide phase, oxide phase, grain growth, crystallization