CeO_2 Buffer Layers Deposited on IBAD-MgO Template by Pulsed Laser Deposition

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To investigate the feasibility of CeO_2 as a buffer layer on the ion-beam assisted deposition (IBAD)-MgO template, we studied the effect of processing parameters on the texture and the surface roughness of CeO_2 layers fabricated by pulsed laser deposition (PLD). The IBAD-MgO template used in this experiment has in-plane texture (value) of 6.5° and RMS roughness of 5 nm. As the processing parameters, substrate temperature (T_S), target-to-substrate distance (D_{TS}), and deposition time (i.e., film thickness) were varied under a fixed oxygen pressure (PO_2) of 10 mTorr. All CeO_2 buffer layers showed large (00l) peaks and a small extra (111) peak. At D_{TS} of 6 cm, (00l) peaks were more dominant than other D_{TS}. The CeO_2 buffer layers exhibited value of 5.0 – 6.0° and RMS roughness of 2.0 – 3.0 nm. These results support that CeO_2 is a promising candidate as an effective buffer layer on the IBAD-MgO template. Detailed relationship among processing parameters, surface roughness, and textures of CeO_2 buffer layer will be presented for a discussion in this paper. This research was supported by a grant from Center for Applied Superconductivity Technology of the 21st Century Frontier R&D Program funded by the Ministry of Education, Science and Technology.

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