PO3076

Erbium oxide thin films deposited by filtered cathodic arc and high-power impulse magnetron sputtering

Freimut Koch[1], Anne Houben[1], Stefan Lindig[1], Christian Linsmeier[1]

[1]Max-Planck-Institut für Plasmaphysik, Garching, Germany

freimut.koch@ipp.mpg.de

Numerous investigations on erbium oxide (Er_2O_3) have been reported for different applications due to its properties such as the high dielectric constant or the photoluminescence at room temperature. The high performance as a hydrogen diffusion barrier could be used to reduce the accumulation of tritium in the structural materials of a nuclear fusion power plant.
Tritium permeation barrier films have been deposited by filtered cathodic vacuum arc deposition (FCVA) in reactive mode using an Er target and oxygen gas. The high degree of ionization of the evaporated species offered by this technique enables tayloring the properties of the deposited Er_2O_3 coatings. Adjusting the ion energy by applying a substrate bias allows to select the crystalline phase. Depending on the deposition parameters, either the cubic C- or the monoclinic B-phase can be obtained.
For the droplet-free deposition on large areas high-power impulse magnetron sputtering (HiPIMS) is appropriate. It offers the advantages of magnetron sputtering combined with a high fraction of ionized species.
This work compares the properties of Er_2O_3 films deposited with both methods, FCVA and HiPIMS. The produced layers are characterized with respect to their structure and morphology by X-ray diffraction and scanning electron microscopy with STEM detector.

Keywords
Filtered vacuum arc
HiPIMS
Erbium oxide
Hydrogen permeation barrier
Thin films