

Band Gap Tuning of CeO₂ thin Films by 80 keV N ion Implantation

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Abstract—CeO₂ is well known rare earth oxide material having widespread applications in solid oxide fuel cells (SOFC), photo-catalytic, High-K oxide, window glasses, optoelectronics, gas sensors, and redox activities etc [1, 2]. Recently, due to finding of room-temperature ferromagnetism (RTFM), CeO₂ has been a key subject of intense research for their potential applications in spintronics [3]. It also finds application as a sustainable fossil fuel material due to generation of hydrogen through photocatalytic water splitting [4]. In the present work we have investigated the structural, morphological and optical properties of 80 keV N ion implanted CeO₂ thin films. These thin films were deposited over the quartz substrates using RF technique. The deposition was carried out in Ar gas environment at RF power of 150 W for 1 hour. The films are characterization before and after N ion implantation using versatile techniques i.e., X-ray diffraction (XRD), Atomic force microscopy (AFM), PL spectroscopy and UV/vis spectroscopy to study the various physical properties of these films. XRD confirms the cubic fluorite (FCC) structure and space group (Fm-3m) correspond to CeO₂ [1]. The band gap values were decreased with N fluence which is correlated with formation of defects after N ion implantation in these films.

References

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