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Optical properties of Sm doped CeO_2 thin films produced by liquid solution deposition K.N MITCHELL, C.A RODRIGUEZ, T. WILLETT-GIES, Y. LI, S. ZOLLNER, New Mexico State University — Cerium(IV) oxide (CeO_2 or ceria) is a transparent, insulating oxide of the rare earth metal cerium. Ceria is an ionic conductor with applications in fuel cells, as a catalyst, or photovoltaic water splitting (hydrogen production). The films studied here were produced by liquid solution deposition followed by annealing. Additionally we investigate the effect of Sm doping (up to 20%) of ceria. The rare earth metal samarium usually forms a sesquioxide Sm_2O_3. Therefore, doping ceria with Sm is expected to lead to the formation of oxygen vacancies, which enhances the ionic conductivity of ceria. Our ellipsometry spectra can be described very well in the transparent region (below 3 eV) using a Tauc-Lorentz dispersion model for ceria. Once the thickness parameters have been determined, we obtain the optical constants of CeO_2:Sm using a basis spline expansion. As expected from Kramers-Kronig consistency, we find a significant reduction of the height of the main absorption peak at 4 eV. The direct band gap, however, remains at 3.7 eV, independent of Sm content. We will also report XRD, AFM, and Raman results for our Sm-doped ceria films.

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