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PROCEEDINGS PAPER

Temperature dependence of optical properties in Sn_{0.925}Mn_{0.075}O₂ film determined by transmittance spectra

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Published: **16 February 2011**; 4 pages; 111 papers;
DOI: **10.1117/12.888311**

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Paper Abstract

Near-infrared-ultraviolet optical properties of Sn_{0.925}Mn_{0.075}O₂ (SMO) film grown on c-plane sapphire substrate have been investigated by the transmittance spectra in the photon energy of 0.45-6.5 eV (190-2650 nm) from 5.3-300 K. The optical constants have been extracted by fitting the experimental data with the **Adachi's** model. The optical band gap of the film can be estimated from the relation $(\alpha E)^2$ proportional to $(\hbar\nu - E_g)$. It is found that the absorption edge shifts to a lower energy side with increasing the temperature and the band gap E_g decreases from 3.80 to 3.72 eV. The parameters α_B and θ_B of the Bose-Einstein model are 45.4 meV and 221.8 K, respectively, which could be ascribed to the thermal expansion of crystal lattice and the carrier-phonon interaction. The band narrowing coefficient dE_g/dT of the SMO film is estimated to be -3.92×10^{-4} eV/K at room temperature.

This paper was published in SPIE Proceedings Vol. 7995
Seventh International Conference on Thin Film Physics and Applications, Junhao Chu; [Zhanshan Wang](#), Editors, 79950X

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