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# Temperature dependence of optical properties in $Sn_{0.925}Mn_{0.075}O_2$ film determined by transmittance spectra

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**Paper Abstract**

Near-infrared-ultraviolet optical properties of $Sn_{0.925}Mn_{0.075}O_2$ (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$(hu\text{-}E_g)$. 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 $\alpha_B$ and $\theta_B$ 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 $-3.92 \times 10^{-4}$ eV/K at room temperature.

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