

## 文献

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### Temperature dependence of electronic band transition in Mn-doped SnO<sub>2</sub> nanocrystalline films determined by ultraviolet-near-infrared transmittance spectra

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#### 抄録 (Abstract)

Mn-doped SnO<sub>2</sub> (SMO) nanocrystalline films with the composition from 2.5 to 12.5 have been prepared on quartz substrates by pulsed laser deposition. The temperature dependence of electronic structures and optical constants in the SMO films have been investigated by transmittance spectra from 5.3 to 300 K. Optical response functions have been extracted by fitting the transmittance spectra in the photon energy range of 0.5-6.5 eV with the Adachi's model. It was found that the absorption edge presents a red-shift trend with increasing Mn composition, and the optical band gap (OBG) is varied between 4.22 and 3.44 eV. Moreover, as the Mn composition increases, the temperature dependence of OBG becomes weaker. The band gap narrowing value [(5.3 K)-(300 K)] has been reduced from 98 to 3 meV and linearly decreases with the Mn composition. The phenomena could be attributed to the transition from low doping level SnO<sub>2</sub> band-like states to Mn-related localized states. Moreover, the Urbach energy shows the degree of the structural disorder, which could be explained by an empirical formulas in different temperature regimes. © 2011 Elsevier Ltd. All rights reserved.

#### 著者キーワード

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