

Abstract Submitted
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Electronic and Optical Properties of ScN and (Sc,Mn)N Thin Films Deposited by DC-Magnetron Sputtering BIVAS SAHA, School of Materials Engineering and Birck Nanotechnology Center, Purdue University, GURURAJ NAIK, VLADIMIR DRACHEV, ALEXANDRA BOLTASSEVA, School of Electrical and Computer Engineering, Purdue University, ERNESTO MARINERO, School of Materials Engineering and Birck Nanotechnology Center, Purdue University, TIMOTHY SANDS, Schools of Materials and Electrical and Computer Engineering, Purdue University — Scandium Nitride (ScN) is a rocksalt semiconductor with an interesting electronic structure for optoelectronic and dilute magnetic semiconductor applications. We present detailed studies of the electronic transport and optical properties of ScN and its alloys with manganese nitride (MnN). Our results suggest (a) dilute manganese doping in ScN compensates for the high n -type carrier concentrations arising due to oxygen impurities, and (b) an n -type to p -type carrier type transition occurs at a composition between 5.8% and 11% Mn on Sc sites. In terms of its optical properties, our analysis clearly indicates direct and indirect bandgap absorption edges of ScN located at 2.04 eV and 1.18eV respectively. In addition to the direct gap absorption edge, (Sc,Mn)N samples also show Mn-defect induced electronic absorption. Photoluminescence measurements at room temperature from ScN films exhibit a yellowish-green emission corresponding to direct gap radiative recombination. Direct gap recombination is not expected given the smaller indirect gap. A possible role of high excitation intensities in suppressing relaxation and recombination across the indirect bandgap is suspected..

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