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**Optical study of  $\text{Nd}_{0.5}\text{Sr}_{0.5}\text{MnO}_3$  thin films on  $\text{SrTiO}_3$**  SEUNG YUP JANG, M.W. KIM, K.W. KIM, T.W. NOH, ReCOE & FPRD, Department of Physics and Astronomy, Seoul National University, Korea, N. NAKAGAWA, H.Y. HWANG, Department of Advanced Materials Science, University of Tokyo, Japan — Doped rare earth manganites show interesting phase diagrams depending on strong coupling among spin, charge, and orbital degrees of freedom. Especially,  $\text{Nd}_{0.5}\text{Sr}_{0.5}\text{MnO}_3$  (NSMO) undergoes two phase transitions of para-magnetic insulating state to ferro-magnetic metallic state (FMM) and FMM to charge/orbital ordered insulating state as temperature decreases. When NSMO is grown as a thin film on  $\text{SrTiO}_3$ (STO) (001), it has no phase transition. Recently, however, thin films grown on STO (110) substrates were found to retain the phase transitions of bulk NSMO. This implies that the charge/orbital state could be modulated by controlling lattice strain. We have investigated the optical conductivity spectra of NSMO epitaxial thin films grown on STO substrates. Optical spectra of NSMO grown on STO (110) show drastic change, depending on temperature and polarization. Based on the careful comparison between the films grown on differently oriented STO substrates, we demonstrate that the substrates strain can cause crucial effect on the ground state of NSMO to result in a novel insulating state which is rarely known.

Soon Jae Moon  
ReCOE & FPRD, Department of Physics and Astronomy  
Seoul National University, Korea

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