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Unusual Spectral Weight Transfer in Temperature-dependent Optical Spectra of the Pyrochlore $Nd_2Mo_{2-x}Ti_xO_7$ KYUNGWAN KIM, M. W. KIM, T. W. NOH, ReCOE, School of Physics, Seoul National University, Seoul 151-747, M. SATO, Department of Physics, Division of material Science, Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-8602 — We investigated the optical conductivity spectra of the pyrochlore $Nd_2Mo_{2-x}Ti_xO_7$ single crystals of $x = 0.0$, 0.1, and 0.3. Recently optical spectra of a ferromagnetic metal $Nd_2Mo_2O_7$ and a spin glass insulator $Y_2Mo_2O_7$ were understood in terms of the Orbitally Degenerate Hubbard Model (ODHM). According to the model, the ferromagnetic correlation of nearest neighbors gives the lowest energy optical transition and the metallic conductivity of $Nd_2Mo_2O_7$. Because Ti ions have no d-electron, the Ti substitution should decrease both of the carrier density and the magnetic moment of the system. The optical spectra of Ti-substituted samples showed strong decrease in the transition located below 1.0 eV. In the meanwhile, the temperature dependent optical spectra revealed an unusual spectral weight transfer. That is, the total spectral weight below the charge transfer energy from O $2p$ to Mo $4d$ states increased as temperature increased. And this unusual spectral behavior became more conspicuous as x increased. Based on the ODHM, possible origins of the large spectral change and the relation of the magnetic and the electronic structures will be discussed.

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