Probing the photo induced phase transition in $(C_2H_5)_2(CH_3)_2Sb[Pd(dmit)_2]_2$ I

N. Fukazawa[1], T. Ishikawa[1], R.Nakazima[1], Y. Matsubara[1], M. Kitayama[1], S. Koshihara[1,2], Y. Okimoto[1], K. Onda[1], M. Tamura[3,4],and R. Kato[4]

[1] *Tokyo Institute of Technology, 2-12-1 Oh-okayama, Meguro-ku, Tokyo 152-8551,Japan*
[2] *ERATO "Non-equilibrium Dynamics Project", JST*
[3]*Tokyo University of Science, 2641, Yamazaki, Noda, Chiba 278-8510, Japan*
[4]*Riken, CREST-JST, 2-1, Hirosawa, Wako, Saitama 351-0198, Japan*

E-Mail: nfukazaw@chem.titech.ac.jp

$(C_2H_5)_2(CH_3)_2Sb[Pd(dmit)_2]_2$ shows a unique valence transition. With decreasing temperature, the dimer Mott insulator phase changes into the charge-separated phase below about 70 K, because of the HOMO-LUMO interchange in the $[Pd(dmit)_2]_2$ dimer.[1] This charge-separated phase seems to be similar to the charge-ordered phase which is widely observed in other molecular crystals and so on. However, the origin of the phase transition is different from other CO transitions. In this work, we performed the femtosecond time-resolved pump-probe reflection measurements, expecting the drastic change of electronic structure by intra-dimer photo excitation which can introduce the instability into the dimer.

Figure 1 shows the typical time dependence of the reflectivity change (ΔR/R) at 50 K. The reflectivity shows an abrupt increase and the exponential relaxation. As shown in the inset of fig.1, it takes less than 0.5 ps for initial stage of the reflectivity change. Assuming that the high temperature phase is induced by the photo-excitation, the magnitude of the ΔR/R at its maximum implies that at least 5 dimers are converted into the high temperature state by only one photon. Such a efficiency of the photo-conversion and the fast photo response suggest that this system is a good candidate for the photo- induced phase transition system.

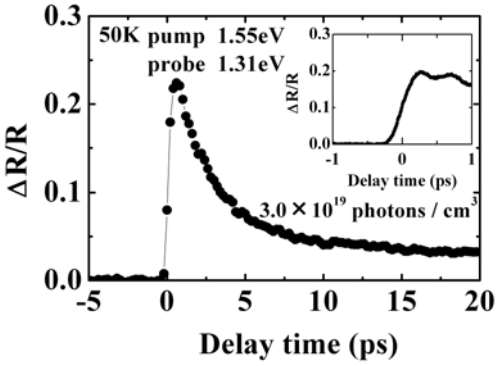

Fig. 1. Time profiles of ΔR/R at 50K. The Inset shows the magnified figure around the time-zero point.

References

[1] M.Tamura *et al.*, Chem. Phys. Lett., 411, 133 (2005).