Anomalous photoinduced dynamics in Cs[Pd(dmit)$_2$]$_2$

Tadahiko Ishikawa$^{1,2}$, Takahiro Tanaka$^1$, Naoto Fukazawa$^1$, Yoshitaka Matsubara$^{1,2}$, Yoichi Okimoto$^{1,2}$, Ken Onda$^{1,2}$, Shin-ya Koshihara$^{1,2}$, Masafumi Tamura$^3$, and Reizo Kato$^4$

$^1$Tokyo Institute of Technology, 2-12-1, Oh-okayama, Meguro, Tokyo, Japan, $^2$CREST-JST, $^3$Tokyo university of science, Yamazaki 2641, Noda, Chiba, $^4$Riken, 2-1, Hirosawa, Wako, Saitama, Japan

§E-mail: tishi@chem.titech.ac.jp

Pd(dmit)$_2$ (dmit=1,3-dithiol-2-thione-4,5-dithiolate) salts are conducting molecular materials which show an unique insulating phase called as a charge separation (CS) phase due to a strong dimerization of cationic Pd(dmit)$_2$ molecules[1]. We have reported a photoinduced (PI) phase transition in the CS phase of the Et$_2$Me$_2$Sb[Pd(dmit)$_2$]$_2$ by using fs-pulsed laser irradiation[1]. The PI phase in this salt is a dimer-Mott (DM) insulating phase which is realized as a high temperature (HT) phase.

Cs[Pd(dmit)$_2$]$_2$ is an another Pd(dmit)$_2$ salt which shows the CS phase transition ($T_c$=56 K) [2]. A HT phase is a metallic phase contrary to the DM insulating one in the Et$_2$Me$_2$Sb[Pd(dmit)$_2$]$_2$ [3]. Thus, a PI phase in the Cs[Pd(dmit)$_2$]$_2$ crystal may be different from the case of the Et$_2$Me$_2$Sb[Pd(dmit)$_2$]$_2$ crystal.

We have measured time-resolved spectra of reflectivity change in the Cs[Pd(dmit)$_2$]$_2$ salt by using a pump-probe type technique combined with the fs-pulsed laser system. Then, complicated time-profiles of reflectivity change have been observed in the CS phase with a strong excitation light. The spectral shape of PI phase just after the photoirradiation is similar to the HT metallic phase. During the relaxation process from the initial PI state to the thermally equilibrium state, the obtained spectral change may indicate appearance of new PI state different from the both metallic and CS insulating one.


