

# Ultrafast Photoinduced Dynamics in the Organic Conductor (EDO-TTF)<sub>2</sub>PF<sub>6</sub>

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Photoinduced phase transition (PIPT) is a phenomenon in which weak light irradiation dramatically changes macroscopic properties of solid material, such as electric conductivity, optical properties, and magnetism [1]. The time scale of this phenomenon is often on the order of femto- or pico-seconds; therefore, it has attracted attention for its applications to a new type of ultrafast photo-switching devices. However, the whole view of this phenomenon is still unclear due to its diverse and complex dynamics.

The quasi-one-dimensional, quarter-filled organic conductor (EDO-TTF)<sub>2</sub>PF<sub>6</sub> has unusual features among materials exhibiting PIPT. It exhibits metal to insulator phase transition at a relatively high temperature (280 K) accompanied by large molecular distortion [2]. It was found that this material undergoes an ultrafast (< 0.2 ps) and gigantic (> 100 %) reflectivity change by ultrashort pulse excitation [3]. We have comprehensively investigated the photoinduced dynamics of this unique material by ultrafast optical spectroscopy and found that photo-excitation induces *not* simple insulator to metal phase transition but diverse photoinduced dynamics as follows (Fig. 1):

1. Charge order pattern is switched by weak near infrared pulse excitation in the low temperature phase [4, 5].
2. Metallic phase emerges at around 0.75 ps by stronger excitation.
3. Double pulse excitation creates this metallic phase more efficiently.
4. Ultraviolet excitation turns the metallic phase into worse metal.
5. Possibility of coherent control of photoinduced dynamics was shown by phase-locked double pulse excitation
6. Early stage of the photoinduced dynamics was revealed by sub-10 fs pulse excitation.

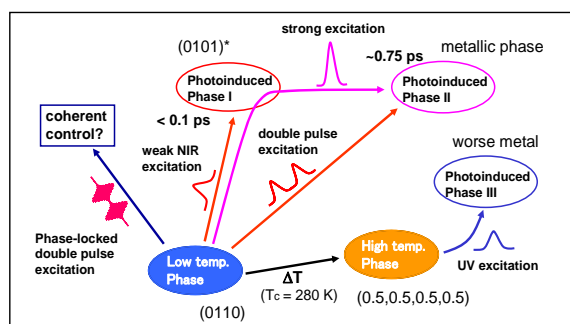


Fig.1. Summary of ultrafast photoinduced dynamics in (EDO-TTF)<sub>2</sub>PF<sub>6</sub>

## References

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