

Search for a hidden phase in strongly correlated systems based on ultrafast structural dynamics

S.Koshihara

*JST, CREST & Department of Materials Science,
Tokyo Institute of Technology,
Meguro-ku, Tokyo 152-8551, Japan*

Tuning cooperative phenomena such as phase transition artificially by external stimulation is a key subject for materials science, device application and even biological science today. Especially, achieving the control of the phase transition by light excitation which is named as photo-induced phase transition (PIPT) is becoming important target for wide field of optical science. In spite of various attractive natures of PIPT, the research of this field is facing a difficult and essential problem, i.e. can we realize and identify a new phase of solid based on novel lattice structure which is unique for the photo-excited condition so called as a 'hidden phase'? Here, we demonstrate that light excitation reveals a 'hidden charge and orbital ordered (CO-OO) phase' which can never be achieved under thermo-equilibrium condition, and it really becomes the origin of the sensitive photo-induced change in optical property of various inorganic and organic crystals utilizing picosecond time-resolved X-ray [1] and femtosecond time resolved electron diffraction techniques [2].

- [1] Ichikawa, H.; Adachi, S.; Cavalleri, A.; Tamaki, R.; Miyano, K.; Koshihara, S.; et al.
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- [2] Gao, M.; Onda, K.; Koshihara, S.; Yamochi, H.; Sciaini, G.; Miller, R.J. D.; et al.
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