

# Time-resolved photoemission study on strongly-correlated materials

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We developed two kinds of pump-probed photoemission systems. The pump-probed photoemission system using 6-eV probed light<sup>1</sup> is powerful for the precise measurement around Fermi level. The pump-probed photoemission system using 60-eV probed light<sup>2</sup> is powerful for the core level measurement. We would like to introduce the several time resolved photoemission results of strongly-correlated materials, such as VO<sub>2</sub>, YbB<sub>12</sub>, and YbAl<sub>3</sub>, as well as TaS<sub>2</sub>, Graphite, and topological insulators.

Figure 1 shows the time-resolved photoemission spectrum of valence-band of a VO<sub>2</sub> thin film.<sup>3</sup> The transition was accompanied by a spectral-weight transfer on a 1-eV scale, which is characteristic of strong electron correlations. The photo-induced metallic state exhibited a unique spectrum that tails up to ~0.4 eV above  $E_F$ . This indicates that the emergent metallic state is different from the rutile state.

We will also introduce the hybridization gap formation in Kondo insulator YbB<sub>12</sub> using time-resolved photoemission spectroscopy.<sup>4</sup>

We would like to show the time-resolved photoemission of core level is also very powerful for several materials.

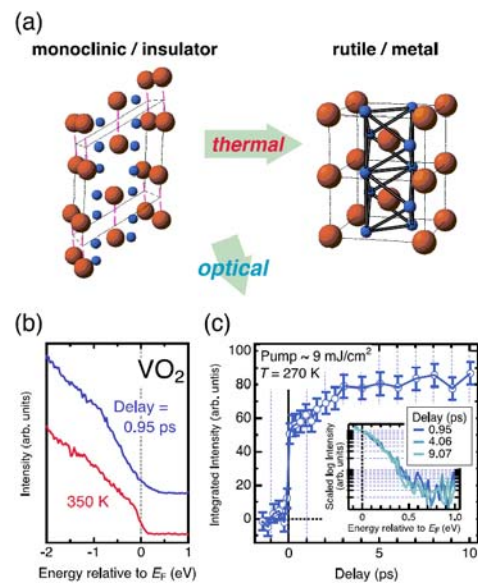


Fig.1 Photoinduced phase transition of VO<sub>2</sub>.<sup>3</sup>

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## References

- <sup>1</sup> Ishida, et.al., Scientific Reports **1**, 64 (2011).
- <sup>2</sup> Ishizaka, et. al., Phys Rev. B **83**, (2011) 081104
- <sup>3</sup> Yoshida, et. al., Phys Rev. B **89**, 205114 (2014).
- <sup>4</sup> Okawa, et al., [arXiv:1407.0578](https://arxiv.org/abs/1407.0578)