「遷移金属酸化物の時間分解 X 線回折」

和達大樹
東大物性研

X-rays from synchrotron radiation (SR) have time structures related to the SR pulse width of several 10 ps. X-ray free electron laser (XFEL) creates intense ultra-short (fs) x-ray pulses, enabling much more detailed study of the dynamics of the materials. We recently performed a time-resolved x-ray diffraction and scattering study in a pump-probe setup by using XFEL in LCLS (USA) [1] and by using SR in BESSY (Germany). The pump light is Ti:sapphire laser (800 nm), and the probe is XFEL or SR. Figure 1 (a) shows the time evolution of the intensity of the superlattice reflection (2 1/2 0) in charge and orbital ordered $Pr_{0.5}Ca_{0.5}MnO_3$ thin films. One can see clear oscillations, which correspond to the frequency of phonons. Figure 1 (b) shows the time-resolved x-ray magnetic circular dichroism (XMCD) intensity in ferromagnetic $BaFeO_3$ thin films, showing rather slow demagnetization of ~ 100 ps.

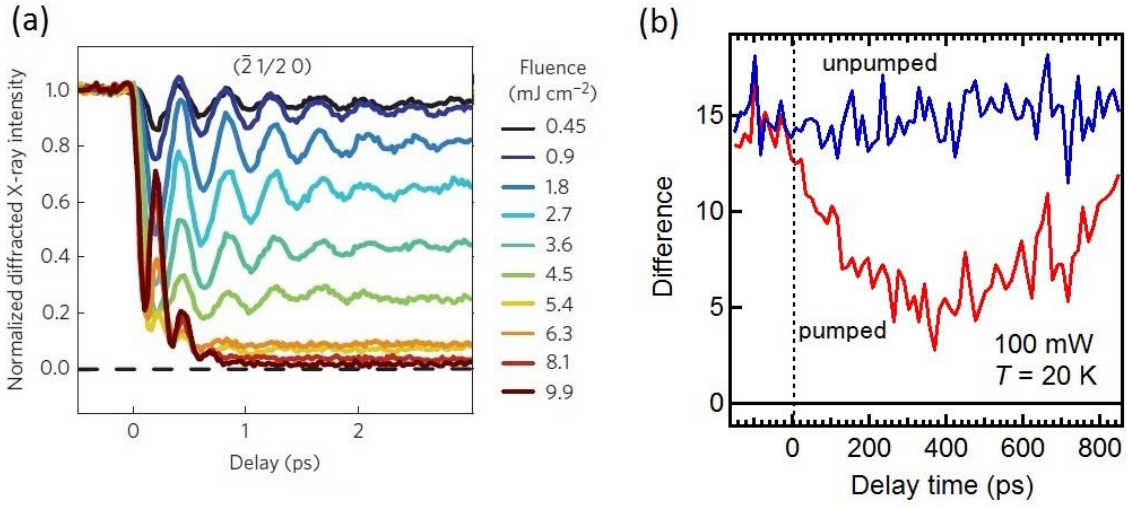

Figure 1: (a) Time evolution of the normalized diffracted x-ray intensity for the (2 1/2 0) reflection in $Pr_{0.5}Ca_{0.5}MnO_3$ thin films taken at 6.53 keV (off resonance). This superlattice peak is sensitive to the structural atomic motion. (b) Time evolution of the XMCD intensity in $BaFeO_3$ thin films taken at 710 eV (Fe $2p_{3/2}$ edge).

[1] P. Beaud, H. Wadati *et al.*, Nat. Mater. **13**, 923 (2014).