Fe(Pt, Pd)薄膜の時間分解磁気円二色性測定

Time-resolved x-ray magnetic circular dichroism measurements of Fe(Pt,Pd) thin films

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Magnetization dynamics in material attracts much attention due to its various physical phenomena such as ultrafast demagnetization [1] and magnetization reversal [2] or its potential of application for spintronic devices. Visible laser of a few eV is widely used as a probe of magnetization dynamics, however, synchrotron x-ray, especially soft x-ray which is an element specific probe by using resonant process between 3*d* state and 2*p* core level, is seldom used for time-resolved measurement. In this presentation, we report that we developed time-resolved x-ray circular dichroism (XMCD) measuring system at BL07LSU, SPring-8 and succeeded in measuring magnetization dynamics in perpendicularly magnetized Fe(Pt, Pd) thin films[3].

We used pump-probe method for obtaining magnetization dynamics. Ti: Sapphire laser (800 nm) irradiates Fe(Pt, Pd) thin film as pump light sample followed by probe x-ray (Fe L_3 edge 707 eV, Fe L_2 edge 720.2 eV) irradiation. We measured XMCD by photoelectron yield, which enables us to measure opaque samples. Opaque samples were not suitable for x-ray transmissivity measurement which is usually used for time-resolved XMCD measurement. $FePt_{0.9}Pd_{0.1}$ thin film fabricated on MgO substrate by sputter method was used. Figure 1 shows intensity change after pump laser irradiation by right- and left-handed circular polarized x-ray. We succeeded in capturing demagnetization and recovering processes. Time-resolution reaches time width of x-ray ~ 50 ps. Demagnetization threshold of laser intensity was measured and that suggests light-induced demagnetization.

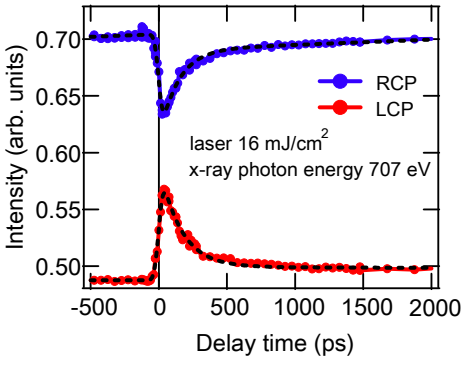

Fig. 1: Result of time-resolved XMCD measurement of Fe(Pt, Pd) thin film.

[1] E. Beaurepaire *et al.*, Phys. Rev. Lett. **76**, 4250 (1996).
[2] C-H. Lambert *et al*., Science **345**, 1337 (2014).
[3] K. Takubo, K. Yamamoto *et al.*, arXiv: 1701.03156.