

## Effect of additive element on light-helicity induced magnetization dynamics in $\text{Co}_{1-x}\text{Y}_x$ ( $\text{Y} = \text{Pt}, \text{Pd}, \text{Ni}$ ) alloy

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Magnetization control using light has drawn considerable attention for diverse magnetic applications, including laser-assisted magnetic recording and optically writable spintronic memory [1]. Among these, helicity-dependent all-optical switching (HD-AOS) enables direct manipulation of ferromagnetic metal magnetization by tuning the helicity of incident light [2]. Although multiple mechanisms have been proposed for HD-AOS, accumulating evidence suggests that light-induced effective magnetic fields and spin polarization exert both field- and damping-like torques on magnetization [3,4]. More recently, our group reported that electron orbitals can also be generated by light helicity, as demonstrated by time-resolved magneto-optical Kerr effect (TRMOKE) measurements of CoPt alloy thin films [5].

In this study, we systematically investigate light-helicity-induced magnetization dynamics in  $\text{Co}_{1-x}\text{Y}_x$  ( $\text{Y} = \text{Pt}, \text{Pd}, \text{Ni}$ ) thin films. These samples were grown on thermally oxidized Si substrates via ultrahigh vacuum magnetron sputtering, with compositions finely tuned by co-sputtering. We conducted TRMOKE measurements under a 2 T in-plane magnetic field, observing magnetization precession initiated by circularly polarized pump pulses. Figure 1(a) shows a representative waveform from Co-Pt alloy films, fitted with a damped sinusoidal function to derive the oscillation amplitude  $A$  and phase  $\varphi$ . Figure 1(b) plots  $\varphi$  against  $x$ , revealing a clear increase in  $\varphi$  with  $x$ , which points to a damping-like torque arising from helicity-driven orbital generation. Further details of these findings and the underlying physics will be discussed in our presentation.

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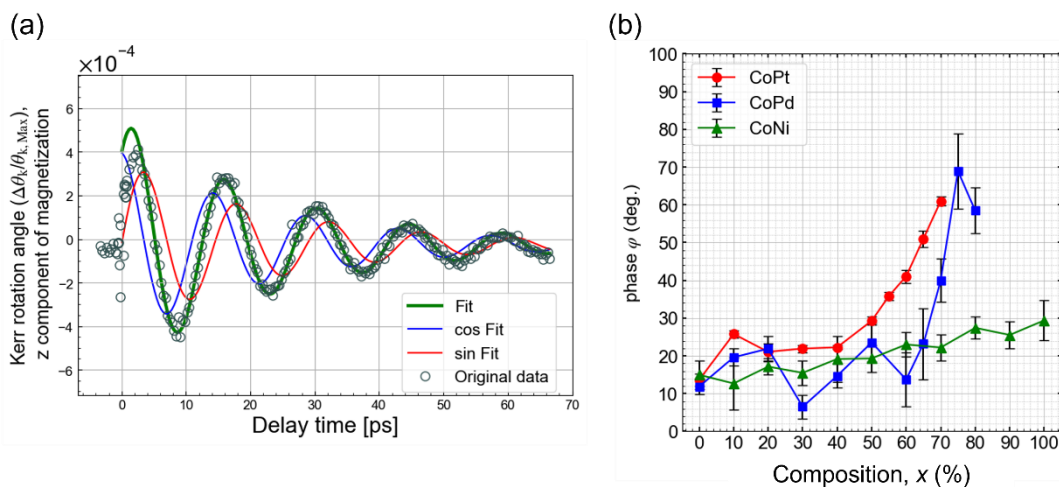


Figure 1 (a) Typical data for light-helicity induced magnetization dynamics in CoPt alloy thin film.

(b) Oscillation phase  $\varphi$  plotted as a function of composition of additive elements  $x$ .