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Spin-depth profile studies in Co/Pt multilayers with All-Optical Switching by Polarized Neutron Reflectometry

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All-Optical Switching (AOS) is a phenomenon which is currently attracting significant attention due to its potential applications in magnetic memory storage technologies. The grand advantages against other storage solutions are its high energy efficiency and ultrafast magnetic dynamics [1]. The AOS consists in deterministic reversal processes of magnetic domains induced by femtosecond laser pulses. This phenomenon allows for ultrafast and photon-helicity dependent magnetization switching [2-5] (Fig. 1a) to occur in magnetic thin films and multilayers. AOS occurs in magnetic metamaterials consisting on a wide variety of magnetic thin film materials, including rare- earth alloy thin films and/or transition metal-ferromagnetic material multilayers. In the latter case, a full magnetic characterization of the magnetic behaviour of the multilayer system (FIG. 1b) is crucial to reveal the true mechanism of AOS, as allowing us to tune the material parameters to improve the AOS induction mechanism and phenomena. In this work we show a polarized neutron reflectometry study (FIG. 1c-d) of Co/Pt ferromagnetic multilayer thin films where AOS has been observed, with the objective to relate the quality of the interfaces, possible interlayer diffusion events and the magnetic spin-depth profile onto the observed AOS mechanism and the magnetic properties of the multilayers.

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