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All-Optical Control of Magnetization in various Ferromagnetic Structures[1] RAJASEKHAR MEDAPALLI, University of California San Diego, VINCENT JOLY, Universite de Lorraine, YUKIKO TAKAHASHI, NIMS, Japan, STEPHANE MANGIN, Institut Jean Lamour, Universite de Lorraine, YESHAIAHU FAINMAN, ERIC FULLERTON, University of California San Diego — Until recently, the only class of material that demonstrated all-optical switching (AOS) is a narrow range of rare-earth (RE) and transition-metal (TM) alloy compositions. However, recent experimental investigations have broadened the choice of materials for AOS and showed that optical control of magnetization is a much more general phenomenon. These materials include wide variety of ferrimagnetic RE-TM alloys, RE-free synthetic ferrimagnets and, moreover, ferromagnetic thin films, multi-layers and even their granular films. By employing a magnetization sensitive microscopy technique we investigated the AOS in various ferromagnetic materials like Co/Pt multi-layers as a function of material composition, structure, laser pulse fluence, and multi-layer thickness and also in FePt granular thin films, as a function of grain sizes. Our results show the optimal material conditions in ferromagnets and highlight pathways for reducing possible energy consumption for the AOS in these materials. Moreover, our time-resolved pump-probe measurements on CoPt thin films and their multi-layers reveal the ultrafast magnetization response to the 100 fs laser pulses and its role in AOS.

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