Asymmetric magnetic switching behavior of Py/SmFe/Py exchange spring magnet

JIYEONG GU, HANMING YUAN, Department of Physics and Astronomy, California State University Long Beach, Long Beach, CA 90840 — Magnetic switching behavior of the symmetric exchange spring magnet, Py(Permalloy)/SmFe (or SmCo)/Py thin films, was investigated. Exchange spring magnet shows a unique magnetic hysteresis curve due to the non-collinear magnetization developed by magnetic coupling of the soft and hard magnetic layers. Using Magneto Optical Kerr Effect (MOKE) we could separately measure the magnetic hysteresis loops of the top and the bottom Py layers. We found the magnetic hysteresis loops for the bottom and the top Py layers are different indicating the switching behavior is not symmetric. The coercivity of the bottom Py layer is much smaller than that of the top Py layer. From the comparison of MOKE data to the one measured by Alternating Gradient Magnetometer, we observed that the top Py layer and hard layer switch together representing the top Py layer is strongly coupled to the hard layer and shows a single switching instead of spiral magnetization distribution; while the bottom Py layer shows a non-collinear magnetization behavior as we expect from a typical exchange spring magnet. Thickness of the soft and hard layers was systematically varied to further investigate the asymmetric switching behavior of double exchange spring magnet thin films.