Antiferromagnet controlled tunneling anisotropic magnetoresistance

CHENG SONG, YUYAN WANG, FENG PAN, Tsinghua University, School of Materials Science and Engineering, Beijing, SPINTRONICS TEAM — We investigate tunneling anisotropic magnetoresistance (TAMR) in antiferromagnets (AFM)-based junctions, where Co/Pt magnetization drives partial rotation of AFM moments with the formation of exchange-spring [1]. The existence of exchange-spring is further confirmed by element specified x-ray magnetic dichroism [2]. Because of superior thermal tolerance of perpendicular exchange coupling and the stability of moments of ~ 6 nm-thick IrMn in [Pt/Co]/IrMn/AlO$_x$/Pt junctions, TAMR gets significantly enhanced up to room-temperature [1]. The TAMR behavior in [Pt/Co]/IrMn/AlO$_x$/metal junctions is insensitive to the top metal electrodes [3]. The situation turns out to be different when the top electrode is replaced by AFM. TAMR is observed in IrMn/AlO$_x$/IrMn junctions, where the resistance states are governed by the relative arrangement of the AFM moments adjacent to AlO$_x$ [4]. Our findings would advance the process towards practical AFM spintronics.


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