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Polarization-dependent antiferromagnetic domain wall motion

WEICHAO YU, JIN LAN, JIANG XIAO, Department of Physics and State Key Laboratory of Surface Physics, Fudan University, Shanghai 200433, China — In antiferromagnet, the polarization freedom of spin waves is fully unlocked. Here, we investigate the antiferromagnetic domain wall motion driven by linearly polarized spin waves. Following momentum conservation laws for domain wall system, we establish a rigid domain wall model for antiferromagnetic domain wall motion driven by spin wave with arbitrary polarizations. We discover that, originating from the distinct transmission behaviors of two linear spin wave polarizations when passing through the domain wall, the domain wall can be pushed or dragged by spin wave depending on the carried linear polarization direction. This theoretical prediction on polarization-dependent domain wall motion is confirmed by magnetic simulations. Steering antiferromagnetic domain wall motion by simply tuning the polarization of inject spin wave, as demonstrated here, offers new designing principles for building domain-wall based magnetic processing components.

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