Out of plane antiferromagnetic spins induced by reorientation transition in NiO(111)/Co bilayers

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While the engineering of magnetic anisotropy (MA) in ferromagnets (FM) has been intensively studied, the control of antiferromagnets (AFM) is now in focus of the magnetism community. The aim of AFM spintronics is to complement or replace ferromagnets in the active components of spintronic devices. NiO(111) is of particular interest as the high Neel temperature and easiness of controlling reorientation of in-plane [1] antiferromagnetic spins via coupling with a ferromagnet make it a potential candidate for practical applications. We used X-ray magnetic linear and circular dichroism (XMLD and XMCD) spectroscopy at Solaris PIRX end-station to study polar spin reorientation transition (SRT) in NiO(111)/Co epitaxial bilayer. XMCD spectra of Co epitaxially grown on Au(111)/W(110) directly proved an in-plane to out-of-plane SRT [2] induced by decreasing Co thickness. Accordingly, XMLD spectra at the L2 absorption edge of NiO proved that with decreasing Co thickness the antiferromagnetic NiO moments switch to out-of-plane orientation below the critical SRT thickness dCo = 15 Å. The observed polar SRT in antiferromagnet results from AFM/FM proximity effect due to strong interfacial exchange coupling [3].

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