Two distinct magnetic switching mechanisms at a termination-controlled oxide interface

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Magnetic coupling is of vital importance in layered thin film systems applied in spintronics. Strong interfacial magnetic coupling can create non-collinear spin arrangements. For instance, magnetization gradually rotates in a soft magnet coupled to a hard magnet in metallic exchange spring magnets, a technologically important effect to enhance the energy product of permanent magnets. Interfaces of complex magnetic oxides may show characteristics exceeding those of metals based on their more intimate link between lattice and electronic degrees of freedom. I will discuss two different interfacial magnetic structures and switching mechanisms at atomically sharp interfaces between itinerant ferromagnets $SrRuO_3$ (SRO) and $La_{0.7}Sr_{0.3}MnO_3$ (LSMO) which have been analyzed by element-sensitive x-ray magnetic circular dichroism (XMCD). Strong exchange coupling at the SRO-LSMO interface induces a switchable interfacial layer with non-collinear spin texture in the *hard-magnetic* SRO layer. In case of less strong coupling of SRO and LSMO layers, exchange bias and no interfacial layer are observed. The ultra-strong coupling is found at a sharp MnO_2-terminated interface in agreement with density functional theory. Our results indicate the presence of non-collinear spin textures in a spin-polarized conducting oxide which can be controlled by atomic interface engineering and switched in small magnetic field.