

## **First-principles study of magnetic properties in Fe/V, FeCo/V, Co/V and Co/Ru multilayers**

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For Spin-Transfer-Torque Random Access Memories (STT-RAMs) the critical current to induce spin-transfer reversal scales proportional to the intrinsic damping constant and inversely proportional to the spin-transfer efficiency. Further reduction of the critical current density is predicted if one can balance the shape anisotropy with an additional out-of-plane anisotropy. Therefore a detailed understanding of the magnetic anisotropy is crucial. We have studied the origin of magnetic anisotropy in the magnetic multilayer systems Fe/V(001) and FeCo/V(001). The amount of induced perpendicular anisotropy is strongly correlated with the charge transfer and the hybridization at the interface which leads to a ferromagnetic-/antiferromagnetic transient state. We have also studied the multilayer systems Co(fcc)/V(bcc) and Co(hcp)/Ru(hcp) where a strong perpendicular anisotropy has been reported experimentally. Our theoretical investigations show that the observed out-of-plane anisotropy results from a complicated interplay between strain induced anisotropy contributions and interfacial contributions. The theoretical studies suggest that the bulk contribution to the magnetic anisotropy can be altered by the amount of strain and that the interfacial contribution depends strongly on the intermixing at the interface.