Molecular spinterface induced antiferromagnetic exchange bias

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Exchange bias (EB) effect is one of the integral part in spintronics applications, which is triggered by a magnetic coupling at the interface between a ferromagnetic (FM) and an antiferromagnetic material (AFM). This effect has been recently received growing attention in a logical memory device because it can act as 'effective magnetic field' without external magnetic field. In this presentation, I will discuss the giant EB effect at the interface between antiferromagnetic molecular layers and ferromagnetic thin films. Anisotropic magnetoresistance and SQUID-VSM analyses displays large variation of EB field depending on the stacking molecular layer. The obtained molecular EB field could be as high as ~ 2000 Oe. A density functional theory (DFT) calculation shows correlation between EB bias and interlayer coupling. These controllable and tunable organic/inorganic 'spinterface' will provide opportunity to realize new functionalities in hybrid magnetic devices.

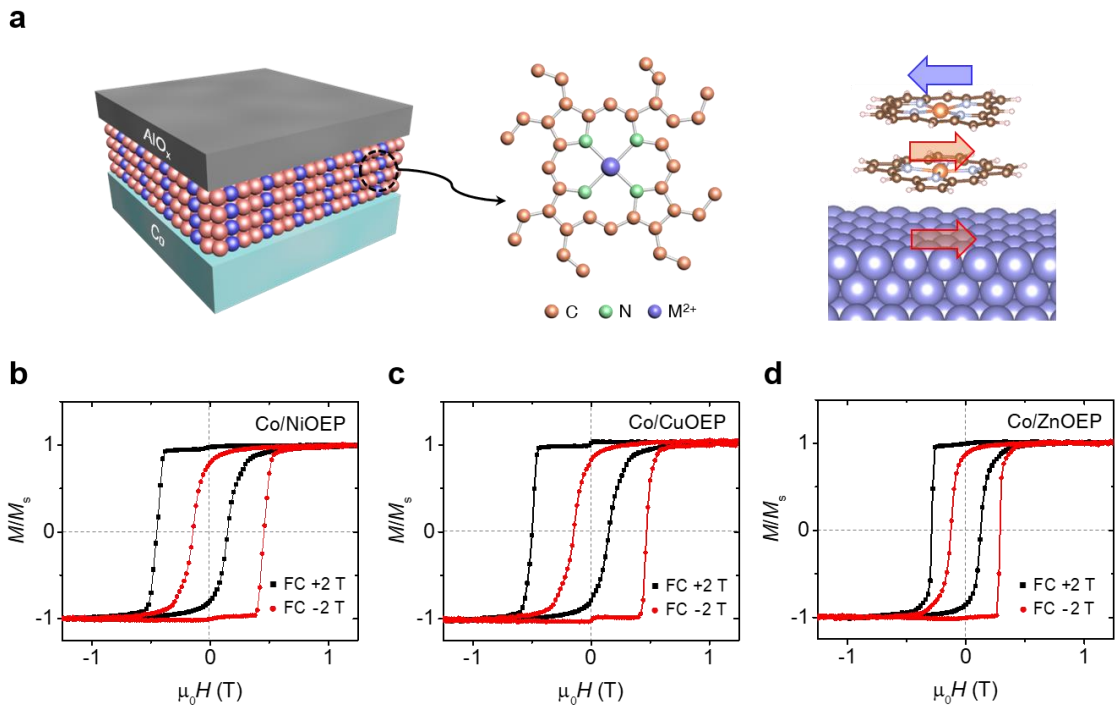

Fig. 1 Antiferromagnetic exchange bias at the hybrid interfaces of Co/MOEP systems (M = Ni, Cu, or Zn). **a** Schematic illustration of the Co/MOEP bilayer and the magnetic coupling therein. A conceived magnetic ordering to induce exchange bias at the hybrid interface (right). **b-d** Normalized magnetic hysteresis loops of the Co(4 nm)/NiOEP(8 nm), Co(4 nm)/CuOEP(8 nm), and Co(4 nm)/ZnOEP(8 nm), respectively. Measurements were done at 10 K after cooling the samples with the applied field of +2 T (■) and -2 T (●). Each system displays an exchange bias that is unidirectional shift of hysteresis loop from the center.