SUPPORTING INFORMATION

Synthesis and size-dependent exchange bias in inverted core-shell MnO|Mn_3O_4 nanoparticles

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S1. XPS Analysis of the samples

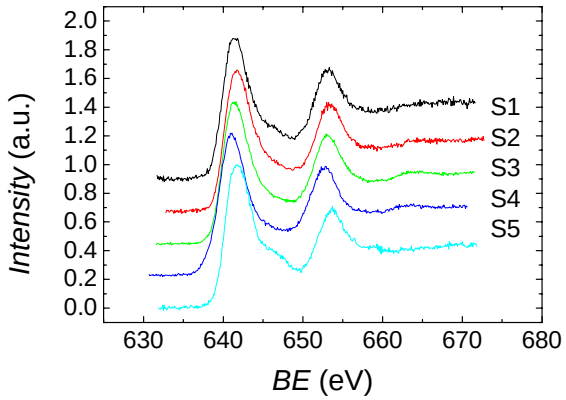

Fig. S1 XPS Mn (2p) core level spectra of various samples.

Figure S1 shows that the absorption edges of the Mn 2p3/2 and 2p1/2 lines are centered around 641 and 653 eV, respectively. The position of the lines indicates that the oxidation state of Mn at the surface is a mixture of Mn (III) and Mn (II) (in lower percentage). The ratio of cations indicates a composition close to Mn_3O_4.[R1-R3]

S2. Temperature dependence of the loop shift and coercivity

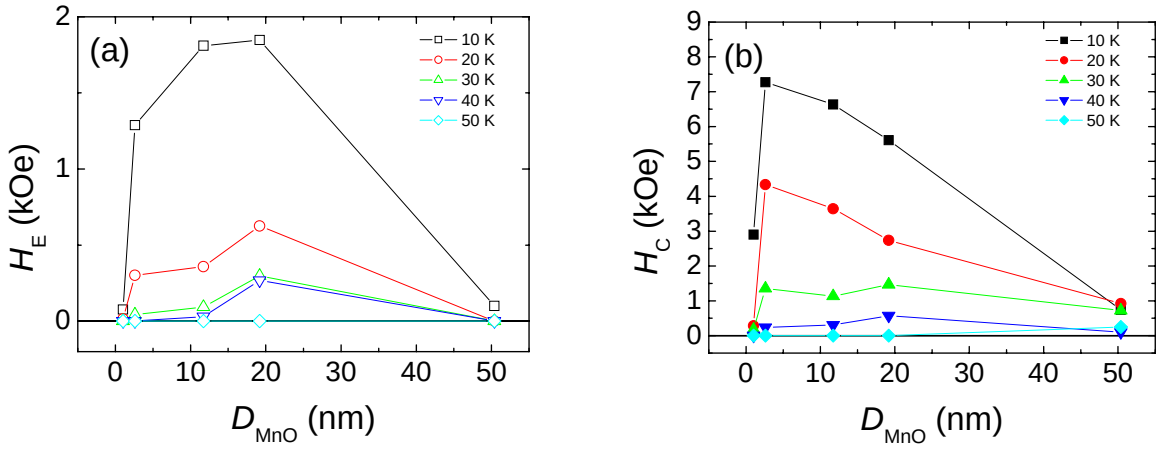

Fig. S2 Variation of (a) the loop shift, H_E, and (b) the coercivity, H_C, after cooling the samples under H_{FC}= 50 kOe from 150 K with the core size, D_{MnO}, and temperature.

Figure S2 presents the dependence of exchange bias, H_E, and coercivity, H_C, with the temperature. As the temperature is increased, H_E and H_C decay as the transition temperature of the ferrimagnetic phase, T_C~43 K, is approached. In all cases, H_E and H_C vanish above 50K.

R1 Langell, M.A.; Hutchings, C.W.; Carson, G.A.; Nassir, M.H.; *J. Vac. Sci. Technol. A* **1996**, *14*, 1656.

R2 Kurata, H.; Colliex, C. *Phys. Rev. B* **1993**, *48*, 2102.

R3 Oku, M.; Hirokawa, K.; Ikeda, S. *J. Electron Spectrosc. Relat. Phenom.* **1975**, *7*, 465.