Exchange biased iron-oxide magnetic nanocomposite

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9.7 cm

In recent years the exchange bias phenomenon (EB) has a great deal of attention because of its potential for use in controlling magnetization in devices, such us spin valves in magnetic reading heads and magnetic random aces memories. The mechanism of exchange bias is explained on layered or core/shell systems with ferromagnetic/antiferromagnetic interfaces due to the existence of a unidirectional anisotropy induced at exchange coupling of FM/AFM system. The Fe_2O_3 material, due to their high Neél temperature, was supposed to be a good candidate of the biasing material. In our work, the iron oxide nanoparticles were incorporated into self-assembled periodic nanoporous silica, which exhibits 2D, hexagonally arranged channel system, with mean diameter of the channels about 7 nm. Magnetic properties measured on a SQUID-based magnetometer at 2-300 K and in the field up to 5 T, experimentally confirm the existence of exchange bias effect in our system. The zero-field cooled (ZFC) loop, measured at 10 K, was symmetric around the origin whereas the 10 kOe, field-cooled (FC) magnetization curve was strongly displaced from the origin and broadened. The value of displacement defines the exchange bias field 509 Oe. The coercivity enhancement defined as $\Delta H_c = H_c(FC) - H_c(ZFC)$ = 143 Oe was obtained from the measured loops.

13.4 cm

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