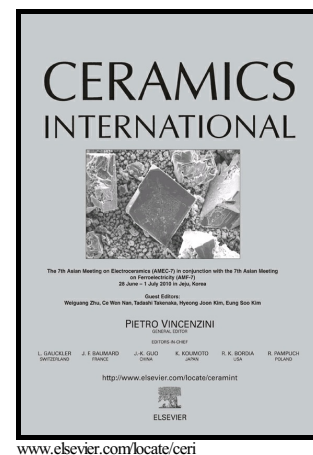


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The role of shell thickness on the exchange spring mechanism of cobalt ferrite/iron cobalt magnetic nanocomposites

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Abstract

CoFe₂O₄/FeCo hard/soft core-shell system with different shell thickness was obtained by precise control of surface treatment conditions of the CoFe₂O₄ nanoparticles under reduced condition. CoFe₂O₄ nanoparticles were subjected to surface reduction treatment for various period of times (10, 15, 20, 25, and 30 min) at 550 °C in order to optimize the thickness of FeCo soft shell. The phase evolution, morphology, coercivity and magnetization of the nanocomposites were examined by X-ray diffraction, electron diffraction pattern, transmission electron microscope, and vibrating sample magnetometer. The single-phase-like hysteresis loops and Henkel plot reflect the existence of the exchange coupling phenomenon in the core-shell nanocomposite. The enhancement of maximum energy product, (BH)_{max}, by 50% with respect to the pure CoFe₂O₄ nanoparticles is obtained for a sample treated at 20 min.

Key words: nanocomposite, Core-shell, maximum energy product, exchange coupling

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