

Chemically synthesized carbon coated NiFe-based nanoparticles

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Magnetic materials are nowadays broadly investigated due to growth novel green energy sources. One of the materials, which is considered as magnetically hard and destined for future applications, is NiFe-based alloy crystallizing in the L1₀ structure. There are various ways to obtain the L1₀ structure, including physical and chemical methods, for example rapid quenching or reduction and isothermal annealing. NiFe-based and CoFe-based core-shell nanoparticles with carbon were prepared by use of precipitation method followed by isothermal annealing of prussian blue analogue (PBA) at 320°C. The XRD analysis of the NiFe annealed for 7 days, showed two types of NiFe nanoparticles with possible presence of tetrataenite (L1₀ structure) and Fe₃O₄ (due to high amounts of oxygen). Mostly α -Fe crystals are visible for CoFe-based nanoparticles. One broad exothermic peak was visible on calorimetric curves for both analyzed alloys and is related to the release of residual water and additional at higher temperatures both compounds decompose. Crystallization of the α -Fe phase results in high saturation magnetization of above 160 emu/g for CoFe nanoparticles.

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