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Synthesis of nanopowders Fe-Pt of equiatomic composition

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Abstract

The work is devoted to the synthesis of nanostructured Fe-Pt systems powders by the method of co-reduction of aqueous solutions of metal precursors with hydrazine hydrate as a reducing agent. For the first time, a systematic approach to the study of the sequence of changes in the phase composition in the Fe-Pt system with the equiatomic composition with heating at a temperature range of 30-800 °C was made by mean of high-resolution X-ray diffraction (with a high-temperature chamber) and DSC in combination with thermogravimetric analysis and mass-spectroscopy of gaseous products. As a result of annealing a radiographically pure Fe-Pt phase with a face-centered tetragonal crystal lattice is detected on XRD-pattern.

A common feature of most methods for obtaining the face-centered tetragonal phase of the Fe-Pt with equiatomic composition is the formation, at first, of products with low coercivity or in the form of a disordered phase of a solid solution with a face-centered cubic lattice (A1) or a mixture of phases with an ordered cubic lattice and an ordered tetragonal lattice (L12 and L10), followed by heat treatment at high temperatures in the range 700-800 °C for transformation to L10. In this case, as a rule, there is an undesirable enlargement of the particles and an increase in the polydispersity. Therefore, in addition to the development of simple and inexpensive methods for producing powders of nanostructured Fe-Pt systems, a study of the nature of the processes leading to phase transitions also requires studies in the direction of reducing the formation temperature of the ordered tetragonal phase. To solve these problems, a thorough analysis of the obtained data on the change in the phase composition and the structural-phase parameters of Fe-Pt during heat treatment is required.

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