

SYNTHESIS AND PROPERTIES OF NANOCRYSTALLINE MgO-Fe, RECEIVED BY REDUCTION OF IRON-MAGNESIUM OXALATE IN HYDROGEN

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The main obstacle for practical using of unique properties of nanoparticles is its high physical-chemical activity, which initiates various processes, leading to enlargement of particles, that result in changing of its structure state and physical properties. One of methods for decision of this problem is creation of composites - the systems, where nanoparticles are in matrix. This matrix protects nanoparticles from agglomeration, but saved its unique properties. In last time different methods of reduction of transition metals oxides in hydrogen atmosphere are used often for fabrication of such nanocomposites. One of method of fabrication of initial mixture or solutions of metals oxides is preparation of mixed magnesium – iron oxalates as precursor with its following dissociation. In this connection the purpose of present work was the investigation of influence of oxygen concentration in atmosphere of magnesium – iron oxalate under dissociation on phase composition and structure of magnesium and iron oxides and on following dispersity of nanocrystalline composite MgO-Fe, obtained by reduction of oxides in hydrogen atmosphere.

In present work the dissociation of magnesium-iron oxalate in three atmospheres: on air, in Ar atmosphere of high purity and in vacuum. The reduction of mixtures of magnesium and iron oxides was carried out in gas mixture Ar+5%H₂

under different temperatures. The phase composition and crystalline structure of powders were investigated on X-ray diffractometers DRON - 3.0 with using Co K α -radiation. Mossbauer spectroscopy was carried out under room temperature on express-spectrometer MC 1101 E.

Fulfilled investigation showed that one-phase state is reached only under dissociation of precursor in vacuum and is solid solution of two oxides MgO and FeO. Under dissociation of precursor in argon or on air magnetite Fe₃O₄ is in obtained powder besides solid solution of oxides (Mg_xFe_y)O. The size of magnetite particles is sufficiently large, order of several hundreds nm. Therefore a size of Fe particles reduced from magnetite has similar order. Thus for receiving of nanodispersive composite MgO-Fe it is necessary to carry out Fe reduction in hydrogen atmosphere from initial mixtures of oxides without magnetite.

Also, it was established, that obtained nanocomposite MgO-Fe have higher thermostability and corrosion-resistance under heating until temperature 700°C.

Thus, carried out investigations showed perspectives of used method for receiving highdispersive particles Fe, stabilised to agglomeration processes and possessing the higher corrosion resistance, that may be used in practice.