OPTIMIZATION THE PLASMADYNAMIC SYNTHES OF ε-FE_2O_3

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Iron oxides are one of the most common compounds which are widespread in nature. In the case of iron oxide Fe_2O_3, α-Fe_2O_3 (hematite) and γ-Fe_2O_3 (maghemite) are the most frequently found minerals and have been widely studied. They have also been used for many applications in industry. As for, ε-Fe_2O_3 are rare phases, and their research have been some the difficulty in obtaining pure phases [1].

However, currently materials that effectively restrain electromagnetic interference in the region of millimeter waves almost do not exist. Thus, finding a suitable material has received much attention. Insulating magnetic materials absorb EM waves owing to ferromagnetic resonance. Particularly, a magnetic material with a large coercive field is expected to show a high-frequency resonance. In recent years, a single phase of ε-Fe_2O_3 nanomagnet has been isolated [2].

This article describes a novel method for obtaining ε-Fe_2O_3 iron oxide powder by using coaxial magneto-plasma accelerator. The air atmosphere pressure P_0 = (1–2) atm. in the chamber-reactor by using oxygen. Dispersity, chemical and phase composition of the powdered material are determined by the original components composition, process energetics, plasma speed and expansion velocity, cooling and hardening of the synthesized material [3].

Series of experiments which show that an increase in the oxygen reactor chamber affects the phase composition of the product and its percentage. This allows to optimize the conditions for the experiments. The maximum number of epsilon phase at 80% oxygen. The synthesized product was analyzed by X-ray diffraction.

Thus, the main result of the paper is a demonstration of the capabilities plasma dynamic synthesis of iron oxide ε-Fe_2O_3. Also, ε-Fe_2O_3 is metastable phase, but our method allows stabilize it.

REFERENCES

[1] *Marie Yoshikiyo, Asuka Namai, Makoto Nakajima, Keita Yamaguchi, Tohru Suemoto, Shin-ichi Ohkosh// JOURNAL OF APPLIED PHYSICS. □2014. □115. □№ . 1-5*

[2] *Shin-ichi Ohkoshi, Shiro Kuroki, Shunsuke Sakurai, Kazuyuki Matsumoto, Kimitaka Sato, Shinya Sasaki// Angewandte Chemie. □2007. □46 □№ . 8392-8395*

[3] *Sivkov A.A., Ivashutenko A.S , Lomakina A.A., Shanenkov I.I.// Applied Mechanics and Materials. □2015. □756. □№ . 325-328*