Synthesis and structural features of Fe_3O_4, γ-Fe_2O_3 and $Co_xFe_{2-x}O_4$ materials for local low-frequency magnetic hyperthermia of cancer tumors

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Ferrimagnetic iron oxides (Fe_3O_4, γ-Fe_2O_3) are promising materials for medical applications due to their suitable magnetic properties and high biocompatibility. Doping of γ-Fe_2O_3 with cobalt is known to improve its functional characteristics for low-frequency magnetic hyperthermia. The samples of Fe_3O_4, γ-Fe_2O_3 and ferrite-type $Co_xFe_{2-x}O_4$ were prepared in a form of sol and powder by chemical deposition from water solutions. The influence of synthesis conditions on the structural and magnetic features of the obtained materials was studied. The best material for hyperthermia appeared to be Co-doped γ-Fe_2O_3 (2.6 mol % of Co) heated at 300 °C. It has a structure of γ-$Co_xFe_{2-x}O_4$ solid solution and a grain size of ~50 nm. The sample is characterized by energy dissipation W ~ 4 J/kg in physiological magnetic field (H = 800 Oe, f = 430 Hz).