

Nanochemistry and biotechnology

Influence of radio frequencies electromagnetic radiation on magnetic properties magneto-mechano-chemical synthesized antitumor nanocomplex

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Magneto-mechano-chemical synthesis (MMCS) includes the fragmentation of separate elements and simultaneous exposure of non-homogeneous constant magnetic and electromagnetic fields causes eddy currents and magnetic vortices in the areas of contact between nanoparticles of iron oxides and organic compounds what the initiate of paramagnetic centers (free radicals) in magneto-sensitive nanoparticles complex (MNC) structure [1]. The aim of this paper is the research influence of radio frequencies electromagnetic radiation on magnetic properties during MMCS of MNC.

We used NP Fe₃O₄ (produced by International Center for Electron Beam Technologies of E. O. Paton Electric Welding Institute, Ukraine) with diameters in the range 20–40 nm and DOXO (Actavis, Romania). MNC during of magneto- mechano-chemical synthesis irradiation by electromagnetic fields in frequency range 0.99 – 42MHz with output capacity 8 W and constant magnetic field 8 mT. The magnetometric method and electron paramagnetic resonance spectra used for instrumentation magnetic properties of MNC.

The number of paramagnetic centers, the magnetic moment and coercivity demonstrated nonlinear properties change in irradiated MNC. g-factor was varied from 2.37 to 2.46. The area of the hysteresis loop of irradiated MNC and EPR spectra intensity had linear Pearson's correlation coefficients respectively $r = 0.72$ and $r = -0.69$ with radio frequency range.

In the near future, the results of this study are promising for practical application in magnetic nanotheranostics of cancer patients.

1. Orel V., Shevchenko A., Romanov A., Tselepi M., Mitrelias T., Barnes C.H., Burlaka A., Lukin S., Shchepotin I. Magnetic properties and antitumor effect of nanocomplexes of iron oxide and doxorubicin // Nanomed. Nanotech. Biol. Med. – 2015. – 11, No 1. – P. 47–55.