STUDYING THE CONDITIONS OF STABILIZATION OF MAGNETIC NANOPARTICLES IN A MAGNETIC TARGETING DRUGS SYSTEM

Vedernykova I.O., Shpychak O.S., Shpychak A.O., [1]Bogdan N.S., [2]Ibadullaeva G.
National University of Pharmacy, Kharkiv, Ukraine,
[1]Bukovinian State Medical University, Chernivtsy, Ukraine,
[2]Asfendiyarov kazakh national medical university, Almaty, Kazakhstan
shpichak_oleg@ukr.net, arujan-d@mail.ru

Recently, there have been very popular works on the design and analysis of magnetically drug delivery systems to "target-organ" (magnetic targeting) under the influence of an external magnetic field. The conditions of stabilization of magnetic nanoparticles in such systems can be defined by structural - rheological properties of the dispersion medium. In the case of using of polar dispersion unstructured environment (such as water) stability of the systems can be achieved using electrostatic and steric stabilization factors. In a viscous base the stabilization of magnet particles is possible without using of surfactant, due to the forces of viscous resistance of the dispersion medium.

For the such systems the nature of interaction of adsorbent-adsorbat between the particles of magnetic phase and surfactant molecules (or environment) should be determined, that affects the state of the surface and subsurface layers of magnetic nanoparticles and thus on their magnetic properties and the magnitude of the magnetic interparticle interaction.

Considering the importance of these samples for biomedical applications and the fact that most applications require the use of this material in the form of aqueous colloidal suspensions, it is worth studying the magnetite surface chemistry and the stability of the particles in water.

The aim of this work is to investigate the aggregation and sedimentation stability of the synthesized magnetite particles in various rheological dispersion medium, to determine the interaction of "adsorbent - adsorbat" between the particles of magnetic phase and the stabilizer molecules.

The samples of magnetite nanoparticles suspended in water-based (surfactant were sodium oleate, 0.5 % aqueous solution of hydrochloric acid, 3 % aqueous solution of pectin) and polyethylene-based (PEO1500:PEO400 8:2) were investigated. Synthesis of magnetite particles was performed by chemical coprecipitation: average particle diameter $\langle d \rangle$ = 20 nm, X-ray density $\rho = 5.2\ g \times cm^{-3}$.

Aggregation and sedimentation stability of water-based magnetite systems were studying. Under the studying the properties of water-based magnetite dispersion it was founded that the use of a solution of hydrochloric acid, sodium oleate and pectin as stabilizers leads to increase d stability of disperse systems (and ζ-potential value) and promotes spatial structuring of colloidal particles. Stable dispersion system PEO/magnetite without the use of surfactants was developed. Surface modification of the magnetic particles using a solution of HCl and polyelectrolytes (pectin, sodium oleate) increases the stability of the systems by 60 %. Using IR-spectroscopy the chemical interaction of SAS molecules with the surface layer of magnetite iron cations was determined.