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APPLICATION OF NATURAL POLYELECTROLYTES IN SYNTHESIS OF IRON OXIDE NANOPARTICLES

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Nanoparticles of hydrated iron oxides represent prospective materials for different biomedical and environmental technologies.[1] The main problem to be solved is aggregation of nanoparticles. One of the ways to solve this problem is a surface modification of nanoparticles using organic macromolecules.

In the present work a synthesis of feroxyhyte (δ'-FeOOH) and lepidocrocite (γ-FeOOH) nanoparticles was carried out by precipitation and oxidation of $Fe(OH)_n^{2-n}$ + $Fe(OH)_m^{3-m}$ suspension directly into aqueous solutions of natural polyelectrolytes (humic substances).

According to electron microscopy data, in presence of humic substances plate-like feroxyhyte nanoparticles with transversal size 20-30 nm and thickness up to 3 nm are formed. Moreover these nanoparticles are encapsulated into humic globules and spontaneously form organo-inorganic composite. At the same time absence of humic substances in reaction mixture leads to uncontrolled growing of nanoparticles up to submicron sizes (transversal size 300-400 nm). Size effect of stabilization of the feroxyhyte nanoparticles using humic substances were confirmed by Mössbauer spectroscopy. However considerable stabilization of lepidocrocite nanoparticles was not achieved. Indeed in presence as well as in absence of humic substances γ-FeOOH nanorods with length about 300 nm and thickness ~ 5 nm were obtained. Apparently such differences in efficiency of stabilization of nanoparticles with different morphology are connected with specific correspondence of steric parameters of plate-shaped nanoparticles and hollows between chains in humic macromolecules. This data open up possibilities for development of new techniques of stabilization of iron oxide nanoparticles using natural polyelectrolytes.

REFERENCES

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