Nanocomposites and nanomaterials

Magnetite-polysaccharide nanocomposites as components of heterogeneous Fenton system

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Synthesis of magnetite nanoparticles and their dispersions in different media is one of the most attractive objectives in the study of magnetic nanomaterials. Magnetite nanoparticles as catalysts can initiate and accelerate sustainable "green" chemistry processes [1]. They are an alternative to equimolar, toxic and corrosive reagents due to simplicity of usage and recycling [2].

Magnetite nanoparticles were obtained by co-precipitation method *in situ* in polysaccharide matrixes such as sodium alginate, sodium carboxymethyl cellulose (CMC), κ- and ι-carrageenans. The mean size of magnetite nanoparticles was 20-40 nm using sodium alginate, sodium carboxymethyl cellulose, and κ-carrageenan. In case of ι-carrageenan larger structures were formed (av. 600 nm).

The catalytic properties of heterogeneous systems Fe_3O_4-polysaccharide-H_2O_2 in the reaction of methylene blue decomposition were studied. It was found that the highest level of discoloration of the dye solution was achieved using Fe_3O_4-κ-carrageenan composite (90 % at 55 ºC).

The value of activation energy for the decomposition of hydrogen peroxide by nanocomposites decreases in the following order:

Fe_3O_4-ι-carrageenan > Fe_3O_4-alginate > Fe_3O_4-CMC > Fe_3O_4-κ-carrageenan.

1. *Li P., Li B., An Z.* Magnetic nanoparticles ($CoFe_2O_4$)-supported phosphomolybdate as an efficient, green, recyclable catalysts for synthesis of β-hydroxy hydroperoxides // Adv Synth Catal.-2013.-**355.**-P. 2952-2959.
2. *Gawande M., Luque R., Zboril R.* The rise of magnetically recyclable nanocatalysts // ChemCatChem.-2014.-**6**.-P. 3312-3313.