USAGE OF NANOMATERIALS AS SORBENTS FOR WATER PURIFICATION

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The world running in 21-st century is facing a major problem and a challenge as water contamination. Contaminated water contains unwanted substances and it adversely affects the quality and makes it unsuitable for use.

In recent years, the use of sorption materials effective results in the treatment of drinking water and wastewater has shown. The advantages of using adsorbents in water treatment technologies are high degree of purification, fairly high capacity, simple ways to regenerate them, allowing their reuse.

At present, the attention of researchers is drawn to nanotechnology, which has indisputable advantages over long-standing and traditionally used materials. Due to the nanoscale size of nanomaterials, their properties, such as mechanical, electrical, optical, and magnetic properties, are significantly different from conventional materials. A wide range of nanomaterials have the characteristics of catalysis, adsorption, and high reactivity. In the past decades, nanomaterials have been under active research and development and have been successfully applied in many fields, such as catalysis, medicine, sensing, and biology. In particular, the application of nanomaterials in water and wastewater treatment has drawn wide attention. Due to their small sizes and thus large specific surface areas, nanomaterials have strong adsorption capacities and reactivity. Heavy metals, organic pollutants, inorganic anions, and bacteria to be successfully removed by various kinds of nanomaterials.

Highly dispersed sorbents and catalysts containing particles with magnetic properties are actively studied. Increased interest is caused by the presence of unusual physical and chemical properties, which is associated with their size and active surface area. Particles of magnetic materials open up great prospects for the creation of systems that exhibit increased activity under conditions of catalytic reactions. One of the optimal materials are nanoparticles based on ferrites.

For example, magnetite Fe_3O_4 as a catalyst used for purification of water from iron ions. Serial experiments investigated the effect of pH, contact time and adsorbate / adsorbent concentration on Fe^{2+} adsorption. Experimental results suggest that the adsorption capacity of Fe_3O_4 nanoparticles towards metal ions depends on the from the concentration of magnetite and iron in water. The value of the sorption capacity of magnetite increases with an increase in the concentration of iron in the solution and with a decrease in the dose of magnetite with an increase in the mixing time and the degree of iron extraction. This is quite logical and fully corresponds to the ideas about sorption processes, including activated adsorption.

Nanotechnology for water and wastewater treatment is increasing day by day. The exclusive properties of nanomaterials show great opportunities for water and wastewater treatment.