- **Nanocomposites and nanomaterials**

Controlled synthesis of composite polypropylene fibers coated with ferrihydrite nanoparticles

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Iron (III) oxides and (oxy)hydroxides are well known as good adsorbents for both organic and inorganic species. Ferrihydrite (Fh) is the only member, which exists exclusively in nanosized state in environment. Possessing ultra high surface area ferrihydrite is a very reactive mineral and it has found applications in medicine, catalysis, electronic device and environmental remediation.

Natural Ferrihydrite ($5Fe_2O_3x9H_2O$) forms generally as a result of rapid hydrolysis of Fe (III) solution. It exists in two crystalline forms, namely low-crystalline 2 line ferrihydtrite (2L-Fh) and more crystalline 6-line ferrihydrite (6L-Fh) according to the number of broadened reflections in X-ray diffractograms. TEM shows single spherical particles of 2-4 nm for 2L-Fh, and 5-6 nm for 6L-Fh.

Ferrihydrite can be easily obtained in the lab. However, being synthesized as colloidal solution or as gel it cannot be directly employed both in static and dynamic adsorption systems. To overcome this drawback we developed a two-stage synthesis of new composite adsorbent based on the polymer fibers coated with ferrihydrite nanoparticles. It involves radiation-induced graft polymerization of acrylic acid monomer onto the polypropylene (PP) fibers followed by the in situ formation of Fh nanoparticles within the grafted chains.

The main aim of the current work was to study the influence of grafted chains on formation of the Fh nanoparticles on the fibers' surface, their size, and morphology; to check chemical stability of the synthesized nanocomposite fibers in waters with a wide pH range. Three groups of PP grafted fibers were chosen for investigation, namely, fibers with low-(50-90%), medium- (100-180%) and high (200-300%) degree of acrylic acid grafting.

SEM with EDS, TEM, XRD, EPR, IR and chemical analyses allowed us to conclude that PP fibers with medium degree of grafting are the most suitable

samples for synthesis of stable nanocomposite fibers.