Magnetic nanocomposites towards clean environment

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Abstract: Environmental pollution caused by anthropogenic activities is one of the biggest challenges globally. One of the largest groups of compounds polluting the aquatic environment are antibiotics, dyes, and pigments, which are mainly released from manufacturing waste from textile, wood, and pharmaceutical industries. Such chemicals not only affect animals living in aquatic systems, but also cause a range of health problems in humans, increasing the risk of cancer and disrupting the endocrine and immune systems. In this work, we focus on wastewater treatment solutions based on magnetic nanomaterials that can effectively purify water through adsorption and can also act as a photocatalyst that can degrade pollutants. The proposed nanomaterials and their composites offer non-toxicity, high surface area and magnetic properties that can be easily removed from solution after wastewater treatment with magnets. The proposed nanomaterials, in particular superparamagnetic iron oxide nanoparticles (SPIONs) and their composites with spent biomass and pyrolyzed biomass, offer high efficiency in water treatment, rapid separation from treated solutions and reuse. Furthermore, SPIONs can also be combined with a wide variety of metal ions, making them a promising platform for the removal of heavy metal ions from contaminated solutions, such as hydrometallurgical waste. The work will discuss the synthesis and characterization as well as the model of adsorption and mechanism of pollutants removal.

Literature:

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