

## Advantages of magnetite nanoparticles as an adsorbent for industrial dye removal

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A large amount of dye remains as wastewater from various industrial sectors such as the food industry, textile industry, etc. Dyes are organic compounds that severely pollute the environment and living organisms. As a result, it is a significant threat to mankind, and so nanotechnology solutions are promising new environmental remediation technology. Through an adsorption mechanism, magnetite nanoparticles effectively excrete organic pollutants. In general, magnetite nanoparticles are iron oxide-based nanoparticles synthesised by mixing different types of salts, ferrous and ferric ions by various conventional methods, which are economically viable methods for producing nanoparticles in large quantities. Therefore, the first advantage is the ease and low cost of economical manufacturing of magnetite nanoparticles. Secondly, magnetite nanoparticles have higher porosity and higher surface area, both of these parameters determine the adsorption capacity of each nanoparticle used for dye removal. Compared with other nanoparticles, magnetite nanoparticles have a large adsorption capacity for all organic dyes and can also adsorb heavy metals. Third, magnetite nanoparticles possess superparamagnetism, which serves as a tool to separate aggregated magnetite nanoparticles after the adsorption of organic dye pollutants. The magnetic properties of magnetite nanoparticles greatly facilitate the separation process and reduce the separation cost of toxic contaminants. Surprisingly, research has proven that magnetite nanoparticles do not change their magnetic properties before and after the adsorption of organic dye compounds. Another remarkable feature of magnetite nanoparticles is that they are non-toxic when used in wastewater for dye removal. Therefore, the low toxicity, magnetic properties, high adsorption capacity and low-cost materials as the properties of magnetite nanoparticles result in better adsorbent materials.

*Keywords: Textile Dyes Removal, Magnetite Nanoparticles, Waste Water Treatment, Nanotechnology, Adsorbents*

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