

## **Iron Oxide-Polymer brush nanocomposites with switchable adsorption properties toward methylene blue**

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The grafting from approach was used to prepare pH-responsive polyacid brushes using poly(itaconic acid) (PIA) and poly(acrylic acid) (PAA) at the amine functional groups of chitosan. Hybrid materials consisting of polymer brushes and magnetite nanoparticles (MNPs) were also prepared. The products were structurally characterized and displayed reversible pH-responsive behavior and controlled adsorption/desorption of methylene blue (MB). Switchable binding of MB involves cooperative effects due to

conformational changes of brushes and swelling phenomena in solution which arise from response to changes in pH. Above the pKa, magnetic nanocomposites (MNCs) are deprotonated and display enhanced electrostatic interactions with high MB removal efficiency (>99%). Below the pKa, MNCs undergo self-assembly and release the cationic dye. The switchable binding of MB and the structure of the polymer brush between collapsed and extended forms relate to changes in osmotic pressure due to reversible ionization of acid groups at variable pH. Reversible adsorption-desorption with variable binding affinity and regeneration ability was demonstrated after five cycles. Additional examples of recent studies on the design and physicochemical properties of polymer-metal composites will be described in this presentation.

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