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Anionically functionalized guar gum embedded with silica nanoparticles: an efficient nanocomposite adsorbent for rapid adsorptive removal of toxic cationic dyes and metal ions

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Abstract:

In the present work, a novel biodegradable nanocomposite has been developed (h-GG/SiO₂) based on anionically modified guar gum and *in-situ* deposited SiO₂ NPs through sol-gel technique. Here the anionically modified guar gum stimulates the silica polymerization process and hence acts as a unique template for the development of spherical SiO₂ NPs. Batch adsorption studies indicate that h-GG/SiO₂ nanocomposite shows remarkable adsorption capacity for cationic dyes/metal ions (Q_{\max} : 781.25 mg g⁻¹ for malachite green (MG), 281.69 mg g⁻¹ for safranin (SF); 645.16 mg g⁻¹ for Pb²⁺, 709.21 mg g⁻¹ for Cd²⁺) as well as it efficiently and selectively removes cationic MG from mixture of dye solutions. Finally the worthy regenerative efficacy of h-GG/SiO₂ facilitates the adsorbent to be economically promising for practical application in the field of wastewater management.

Keywords: Adsorption; Guar gum; Nanocomposite, Sol-gel.

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