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Novel Glutaraldehyde crosslinked Chitosan/GMA/Nickel oxide nanoparticles for Tetracycline, Ofloxacin and Lead removal

Abstract: Emerging micro-pollutants and the resistant bacteria in the water samples related to antibiotic pollution has raised concerns in the scientific community. To tackle this, either the problem should be targeted at the source, or the solution should be top-notch. Thus, we developed biopolymer-based composite using chitosan, glycidyl methacrylate, and nickel oxide to remediate two antibiotics, Tetracycline and Ofloxacin and one heavy metal ion, Lead from their aqueous solution. Batch method was used to optimise the synthesized composite against different parameters which affects the rate of adsorption. The results indicated upto 100% removal of tetracycline and 95% removal of ofloxacin under normal conditions. The material was well-characterized using various spectroscopic techniques like FTIR, SEM-EDX, TEM, XRD, and TGA-DTA. The adsorption isotherm study indicated that the process follows multilayer adsorption governed by Freundlich isotherm model and reaction kinetics followed pseudo-second order rate. Thermodynamic study also revealed the process to be spontaneous, endothermic and favourable at all temperatures. The maximum adsorption capacity was achieved as 394.2, 277.5 and 113.8 mg/g for tetracycline, ofloxacin and lead ions, respectively. This composite showcased outstanding performance while being regenerated upto 6 adsorption-desorption cycles. The novelty and efficacy of this composite makes it a potential candidate as a solution to this existing problem.

Keywords: Chitosan, nickel oxide, nanocomposite, antibiotic, adsorption

Biography: Dr. Divyanshi Mangla is a visionary and versatile professional with a strong foundation in chemistry and an extensive academic and research background. She holds a Ph.D. in Chemistry from Jamia Millia Islamia, New Delhi, with her doctoral thesis focused on developing bio-polymer-based systems for antibiotic removal from wastewater. Dr. Mangla is also a NET-JRF (CSIR-UGC) qualified scholar, reflecting her academic rigor. Her research interests lie in biopolymers, nanocomposites, bio-adsorbents, wastewater remediation, and antibiotic adsorption, underscoring her commitment to addressing critical environmental challenges. With more than 510 citations and an impressive h-index of 7, Dr. Mangla has established herself as a notable researcher in her field.