

Hydrophobic eutectic solvents functionalized graphene oxide nanocomposites: An engineered solution to pharmaceutical remediation

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Abstract:

The World Health Organization has termed antimicrobial resistance (AMR) a "silent pandemic," predicting a surge from the current death toll of approximately 700,000 individuals annually to a staggering 10 million by 2050. A significant contributor to AMR is the persistence of antibiotics in aquatic environments, which poses grave risks to marine ecosystems and human health. Traditional water treatment methodologies often fail to mitigate these contaminants effectively. This research pioneers the use of deep eutectic solvents (DESs) in conjunction with graphene oxide (GO) to significantly enhance the removal of antibiotics from water bodies. Graphene oxide, a promising candidate due to its extensive surface area and superior adsorption characteristics, serves as an ideal framework for this application. The novel integration of DESs, celebrated for their adjustable properties and environmental friendliness, with GO marks a relatively unexplored avenue in removing targeted pollutants.

This study synthesized and thoroughly characterized DES-impregnated GO materials through a straightforward impregnation method, employing techniques such as Fourier-Transform Infrared Spectroscopy (FTIR), UV-Vis Spectroscopy, Total Organic Content (TOC), Scanning Electron Microscopy (SEM), and X-ray Diffraction (XRD). Batch adsorption tests were conducted to optimize contact time, pH, and adsorbent dosage, aiming for peak removal efficiency. The research findings are significant, demonstrating that both pristine and DES-impregnated GO materials exhibit remarkable adsorption efficiency, with removal rates of 86.75 mg/g and 98.40 mg/g, respectively, for the targeted antibiotic. The adsorption behavior follows a pseudo-first-order kinetic model and the Langmuir isotherm model, indicating monolayer adsorption on a uniformly distributed surface.

Biography:

Anjali Goyal is a Ph.D. scholar in Chemical Engineering at Khalifa University, Abu Dhabi, specializing in advanced water treatment technologies. Her research focuses on developing polymeric membranes enhanced with deep eutectic solvents (DES) and graphene-based nanomaterials for the removal of pharmaceutical pollutants. With expertise in membrane fabrication, nanomaterial synthesis, and characterization techniques, Anjali has presented her work at leading international conferences. She is passionate about sustainable solutions for environmental challenges and is actively involved in collaborative research across disciplines. Her dedication to innovation and academic excellence positions her as a rising contributor in the field of environmental nanotechnology. She has published 8 to 10 papers and has one patent.

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