Dye Removal with GO Reinforced Nanocomposite MOFs

Moradkhani, Amitis (School: Indian Springs School)

In this study, silver-based metal-organic frameworks (MOFs) (Ag-MOF) and copper-based MOF (Cu-MOF) were reinforced by graphene-oxide (GO). The reinforced GO-Ag-MOF and GO-Cu-MOF were studied and compared with the regular Ag-MOF and Cu-MOF. The dye removal experiments of these materials were thoroughly evaluated at various pH, temperature, dye, and concentrations. Both GO reinforced MOFs showed 40% and 84 % higher adsorption capacity in comparison to the pure Ag-MOF and Cu-MOF respectively at all the tested conditions due to the enhanced surface charge and active adsorption sites. . Four different MOF compounds, including GO-Ag-MOF, GO-Cu-MOF, Ag-MOF, and Cu-MOF, were synthesized using the sonication technique. The surface morphology of nanoparticles was determined using scanning electron microscopy with gold-coated samples. The appropriate amount of dye (adsorbent) solution and synthesized MOF NP (adsorbate) were added in 40 mL flasks and were shook on the reciprocating shaker. The GO-Ag-MOF exhibited the highest performance by more than 99% dye removal. The surface charge, surface area, number of active sites, and particle size were evaluated as the most effective factors on the adsorption process of dye on synthesized MOFs. The hydrogen bonding and positive charge of methylene blue dye, negative charge of nanoparticles, and MOF showed the importance of physiochemical interaction for adsorption.

Awards Won: