

## **ADSORPTION OF METHYLENE BLUE FROM AQUEOUS SOLUTION BY CALCIUM CARBONATE NANOPARTICLES**

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In recent years, synthesis of various nanomaterials as adsorbents to remediate industrial effluents has become an important area of research. Precipitated Calcium Carbonate (PCC) nanoparticles are one of the cheapest nanomaterials, which can be used to remove various pollutants present in aquatic environments. We have, therefore, used PCC nanoparticles to remove methylene blue in aqueous effluents. The adsorption ability of methylene blue may depend on the phase of the PCC used. As such, we have compared the methylene blue adsorption on the calcite crystalline form of PCC nanoparticles and also on the Amorphous Calcium Carbonate (ACC) nanoparticles. In the preparation of crystalline PCC, first calcined dolomite (CaO.MgO) was added to 1 M sucrose solution to prepare 1 M calcium sucrate (100 mL). Calcium sucrate (50 mL) was then mixed with 1 M sodium carbonate (50 mL) and the resulting solution was stirred, for 1 h, to precipitate calcite nanoparticles. The same procedure was repeated in the presence of 50 mL of sodium salt of poly (acrylate) (0.5 M in repeating units) to synthesize ACC nanoparticles. These PCC products were well dried, in a vacuum oven, and then they were characterized with the help of Powder X-ray Diffraction, Fourier Transform Infrared Spectroscopy and Scanning Electron Microscopy (SEM). Based on the SEM data, the crystallites of calcite and ACC are 26 nm and 22 nm, in diameter, respectively. The SEM images also revealed that the ACC nanoparticles were more aggregated but crystalline nanoparticles were aggregated only to minute extent. These PCC products were well shaken with 5 ppm methylene blue (4 mL each) and were allowed to equilibrate, for 24 h, to study their adsorption behaviours. The supernatants of methylene blue were analyzed using the UV-visible spectroscopy, which gave the percent methylene blue adsorption by 0.02 g, 0.04 g, 0.06 g, 0.08 g and 0.10 g of ACC nanoparticles to be 26.6%, 27.6%, 32.3%, 32.8% and 37.8%, respectively. Percent methylene blue adsorption by 0.02 g, 0.04 g, 0.06 g, 0.08 g and 0.10 g of calcite nanoparticles were 35.1%, 42.2%, 47.6%, 54.9% and 61.9%, respectively. The methylene blue adsorption by the ACC nanoparticles was less than that by the calcite nanoparticles, probably due to the decrease in the surface area: volume ratio of the former, as a result of particle aggregation. These results reveal that the PCC nanoparticles are highly capable of removing methylene blue from aquatic effluents, such as those of garment factories, where they use large quantities of methylene blue, as a textile dye.

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