

ABSTRACT

This research enthusiastically highlights the bio-adsorption of methylene blue (MB) by local, poultry, NaOH and citric acid modified ubiquitous eggshell (LES, NLES, CLES, PES, NPES and CPES) adsorbents. The microstructures of these adsorbents indicated that they had some surface functional moieties that were responsible for the adsorption of MB. The Langmuir isotherm and PSO model best fit the experiment data. The largest Langmuir monolayer adsorption capacity q_{max} , was 242.47 mg/g, with the largest MB initial concentration of 400 mg/L. This was a clear indication and a confirmation that MB adsorption by the powdered eggshells was chemisorptive. Moreover, the values of FF, the thickness of the boundary layer/film were >0 , showing that the rate limiting step for the adsorption process was controlled by more than one diffusion mechanism. The values of ΔG° for the adsorption of MB by the adsorbents indicated that the adsorption reactions were all non-feasible and non-spontaneous. The values for ΔS° (J/K/mol) for LES, NLES and CPES for the uptake of MB showed decrease in the chaos or degree of randomness of the adsorption reactions, and the reverse was the case for PES, NPES and CLES for the uptake of MB, which showed increase in the chaos or degree of randomness of the adsorption. The adsorption of MB by LES, NLES and CPES gave ΔH° (kJ/mol) values which were indicative of endothermic nature of the adsorption systems, and the reverse was the case for the uptake of MB by PES, NPES and CLES, which was indicative of the exothermic nature of the adsorption systems.