

Sorption of Crystal Violet from Aqueous Solution Using Chitosan–Charcoal Composite

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Abstract : The study investigated the removal efficiency of crystal violet from aqueous solution using chitosan-charcoal composite as adsorbent. Deproteination was carried out by placing 200g of powdered snail shell in 4% w/v NaOH for 2hours. The sample was then placed in 1% HCl for 24 hours to remove CaCO₃. Deacetylation was done by boiling in 50% NaOH for 2hours. 10% Oxalic acid was used to dissolve the chitosan before mixing with charcoal at 55°C to form the composite. The composite was characterized by Fourier Transform Infra-Red and Scanning Electron Microscopy measurements. The efficiency of adsorption was evaluated by varying pH of the solution, contact time, initial concentration and adsorbent dose. Maximum removal of crystal violet by composite and activated charcoal was attained at pH10 while maximum removal of crystal violet by chitosan was achieved at pH 8. The results showed that adsorption of both dyes followed the pseudo-second-order rate equation and fit the Langmuir and Freundlich isotherms. The data showed that composite was best suited for crystal violet removal and also did relatively well in the removal of alizarin red. Thermodynamic parameters such as enthalpy change (ΔH°), free energy change (ΔG°) and entropy change (ΔS°) indicate that adsorption process of Crystal Violet was endothermic, spontaneous and feasible respectively.

Keywords : crystal violet, chitosan–charcoal composite, extraction process, sorption

Conference Title : ICERSECU 2017 : International Conference on Environmental Remediation Systems and Environmental Clean Up

Conference Location : Barcelona, Spain

Conference Dates : May 26-27, 2017