

Dynamic behaviour of Cd²⁺ adsorption in equilibrium batch studies by CaCO₃ --rich Corbicula fluminea shell

ABSTRACT

This work presents the structural and adsorption properties of the CaCO₃ --rich Corbicula fluminea shell as a natural and economic adsorbent to remove Cd ions from aqueous solutions under batch studies. Experiments were conducted with different contact times, various initial concentrations, initial solution pH and serial biosorbent dosage to examine the dynamic characterization of the adsorption and its influence on Cd uptake capacity. The characterization of the C. fluminea shell using SEM/EDX revealed that the adsorbent surface is mostly impregnated by small particles of potentially calcium salts. The dominant Cd adsorption mechanism is strongly pH and concentration dependent. A maximum Cd removal efficiency of 96.20 % was obtained at pH 7 while the optimum adsorbent dosage was observed as 5 g/L. The Langmuir isotherm was discovered to be more suitable to represent the experimental equilibrium isotherm results with higher correlation coefficients ($R^2 > 0.98$) than Freundlich ($R^2 < 0.97$). The correlation coefficient values ($p < 0.01$) indicated the superiority of the Langmuir isotherm over the Freundlich isotherm.

Keyword: Adsorption isotherms; Heavy metal; Calcium carbonate; Cadmium; Adsorption mechanism