International Journal of ChemTech Research
CODEN(USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.15 No.02, pp 08-21, 2022

Elimination of copper (II) ions from aqueous solutions by acidified and calcinated clays: kinetic and thermodynamic study

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Abstract : In this work, the purified natural clay is acidified and calcinated at different temperatures and then used to eliminate copper (II) ions in aqueous solution. Characterization tests such as X-ray diffraction, FTIR and SEM, were used to better understand the structure, morphology and behavior of the different adsorbents. The clay is activated by 0.1M hydrochloric acid and the calcination is carried out at different temperatures (500°C, 800°C and 1000°C). The experiments were carried out in batch mode by varying several parameters, namely the contact time, the dose of adsorbent, the pH of the solution, the initial concentration of copper (II) ions in the solution, stirring rate and the temperature of the reaction medium. The results obtained showed that equilibrium was reached after 10min for AC 500°C, 15min for AC800 °C and 20min for AC1000°C. In addition, the linearization of the adsorption isotherms showed that the Langmuir model better explains the adsorption mechanism for the three adsorbents (AC500 °C, AC800 °C and AC1000 °C). The adsorption would be a single layer phenomenon. As for the kinetic study, this work has shown that the pseudo second-order model better explains the adsorption kinetics. The thermodynamic study shows that the copper (II) adsorption process on the three samples is a spontaneous and exothermic phenomenon..
Key-words : Adsorption, Copper (II), Calcinated clays, Kinetics, Thermodynamics.

DOI= http://dx.doi.org/10.20902/IJCTR.2022.150202

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