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Investigation of diclofenac sodium adsorption by a purified Algerian diatomite using hydrochloric acid

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Abstract: The objective of this investigation is to use hydrochloric acid (HCl) at different concentration as a chemical treatment for the Algerian diatomite (DE) in order to get it ready for further applications oriented towards pharmaceutical aspects. Commercial diclofenac sodium (DS) is used to study adsorption on DE in aqueous laboratory conditions. It is found that DE contains roughly 60% SiO2 and 13% CaO. Its morphology is characterized by a porous structure composed of several broken and compacted diatomic aggregates, containing cylindrical and alveolus forms of varying diameters, girdle bands and other clayey compounds. The hydrochloric acid treatment is proven to be one attractive choice as it entails a significant raise of SiO2 and facilitates reducing most of impurities. After 10% HCl (DE-10) treatment of crude DE, the amount of SiO2 increased by over 64%. The result showing DS adsorption as a function of time is optimal for DE-10 as the quantity of the absorbed DS on treated DE (qt) reached 60 mg/g and maintained this equilibrium level from 90 up to 120 min. The pseudo second order model has been successfully applied. The quantity of the absorbed DS on treated DE at equilibrium (qe) and the pseudo second order rate constant (k2) for the case DE-10 are found 114.94 mg/g and 1.3 $10^{?4}$ g $mg^{?1}$ $min^{?1}$ respectively.

Keywords : diatomite, hydrochloric acid treatment, diclofenac sodium, adsorption, pseudo second order model