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New physicochemical interpretations for Adsorption of Ibuprofen on Activated Carbon using Statistical Physics Approach

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Abstract

In this work, the double layer model with two energies (statistical physics model) was applied to interpret the adsorption isotherms of ibuprofen (IBP) on a raw activated carbon and two chemically modified samples. The establishment of this statistical physics model is based on the grand canonical ensemble. The main objective of this work is to give new physicochemical interpretations at molecular level of the adsorption isotherms of IBP. These isotherms of IBP on a raw activated carbon (AC) and two chemically modified samples: AC[H_2O_2]US and AC(700N_2) at pH=7 which were carried out at different temperatures (298, 313 and 323 K). Physicochemical parameters were deduced in this model such as the numbers of molecules per site (n), the receptor sites density (N_M), and the adsorption layer energies (-ε_1,-ε_2). The different parameters were determined by simulation the experimental data and interpreted at different temperatures. By application this statistical physics model, three thermodynamic functions were calculated and interpreted; i.e. entropy (S), free enthalpy (G) and internal energy (E_{int}) to macroscopically characterize this process.

Key words: Adsorption, ibuprofen, activated carbon, double layer model with two energies, potential thermodynamic functions.