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Prediction of multicomponent adsorption by activated carbon using single solute parameters. Part II-Proposed Equation

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Abstract: Prediction of multicomponent adsorption is still one of the most challenging problems in the adsorption field. Many models have been proposed and employed to obtain multicomponent isotherms from single component equilibrium data. However, most of these models were based on either unrealistic assumptions or on empirical equations with no apparent definition. The purpose of this investigation was to develop a multicomponent adsorption model based on a thermodynamically consistent equation, and to validate that model using experimental data. Three barbiturates, namely phenobarbital, mephobarbital and primidone, were combined to form a ternary system. The adsorption of these barbiturates from simulated intestinal fluid (without pancreatin) by activated carbon was studied using the rotating bottle method. The concentrations, both before and after the attainment of equilibrium, were determined with an HPLC system employing a reversed-phase column. The proposed equation and the competitive Langmuir-like equation were both fit to the data. A very good correlation was obtained between the experimental data and the calculated data using the proposed equation. The results obtained from the original competitive Langmuir-like model were less satisfactory. These results suggest that the proposed equation can successfully predict the trisolute isotherms of the barbituric acid derivatives employed in this study.