Modification of Langmuir Isotherm in Solution Systems – Definition and Utilization of Concentration Dependent Factor

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The Langmuir isotherm, derived for the adsorption of gas molecules on solid, surfaces was modified to fit the adsorption isotherm of solutes onto solid surfaces in solution systems. It is known that the use of the Langmuir isotherm in solution systems often leads to poor data fitting. In the present communication, this mismatch widely spread in literature data, was reduced by a simple modification introducing a concentration dependent factor, X. The key concept of the modification lies in that the concentration of solute affects both adsorption and desorption stages. As a first approximation, we adopted a single term polynomial for both processes of adsorption and desorption. Based on reanalysis of literature data of adsorption in solution, we confirmed that indeed the modified Langmuir isotherm more accurately describes the experimental observations. Furthermore, we proposed that the concentration dependent factor might be associated with the surface heterogeneity index that was introduced in a few other modified Langmuir isotherms.