A review of the thermodynamics of protein association to ligands, protein adsorption, and adsorption isotherms - DTU Orbit (22/12/2018)

A review of the thermodynamics of protein association to ligands, protein adsorption, and adsorption isotherms
The application of thermodynamic models in the development of chromatographic separation processes is discussed. The paper analyses the thermodynamic principles of protein adsorption. It can be modeled either as a reversible association between the adsorbate and the ligands or as a steady-state process where the rate of adsorption is equal to the rate of desorption. The analysis includes the competitive Langmuir isotherm and the exponentially modified Langmuir isotherm. If the adsorbate binds to one ligand only, the different approaches become identical. When the adsorbate acts as a ligand, dimerization takes place and will give rise to a sigmoid isotherm. A model that accounts for dimerization is discussed and a sample calculation shows the behavior of this isotherm. Insulin is known to have a concave isotherm at low concentrations. The calculation of the standard Gibbs energy change of adsorption is discussed. Hydrophobic and reversed phase chromatography are useful techniques for measuring solute activity coefficients at infinite dilution.

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