163c Sorption Measurements of Alkanes on Zeolites under Equilibrium and Non-Equilibrium

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The separation of gas mixtures on zeolites is an important step for the production of pure hydrocarbons. The dimensioning and management of industrial plants for adsorption processes needs reliable thermodynamic and kinetic parameters of the adsorbens. The aim of this work is the determination of thermodynamic and kinetic data from sorption measurements of alkanes on Zeolites under equilibrium and non-equilibrium conditions. All measurements were carried out with magnetic suspension balances and we always obtained uptake curves. The data were then compared with results acquired with the help of other techniques. From the height of such steps we can extract adsorption isotherms. The progress of the curves to equilibrium contains transport coefficients. For a better understanding of such systems the value 1-m(t)/mEq was plotted against the time. The received curves degrees in an initial step very fast. After that the curves are linear as far as possible. Such curves indicate a non-isothermal behaviour of the examined system [1]. An explanation is given in the literature [1,2]. The used model is a modified isothermal model with an variable equilibium value. The model is valid in the Henry regime. It can describe only the initial region of the curves. With this model we found transport coefficients in the order of magnitude of 4*10-12 m2/s for the i-butane/Silicalite-1 system. Due to the influence of the adsorption energy the complete curve can only describe with a non-isothermal model.

[1] D.M. Ruthven, L.K. Lee, H. Yucel, Kinetics of Non-isothermal Sorption in Molecular Sieve Crystals, AlChE J. 26 (No.1), 16-23 (1980) [2] D.M. Ruthven, L.K. Lee, Kinetics of Nonisothermal Sorption: Systemswith Bed Diffusion Control, AlChE J. 27 (No.4), 654-663 (1981)