

Adsorption Studies of Methane on Zeolite NaX, LiX, KX at High Pressures

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Abstract : In this study, CH₄ adsorption isotherms on NaX or Faujasite X and exchanged zeolites with Li⁺(LiX), and K⁺(KX) at different temperatures (298, 308, 323 and 353 K) has been investigated, using high pressure (3 MPa (30 bar)) thermo-gravimetric analyser. The experimental results were then validated using several isothermal kinetics models, namely Langmuir, Toth, and Marczewski-Jaroniec, followed by a calculation of the error coefficients between the experimental and theoretical results. It was found that the CH₄ adsorption isotherms are characterized by a strong increase in adsorption at low pressure and a tendency towards a high pressure limit value Q_{max} . The size and position of the exchanged cations, the spherical shape of methane, the specific surface, and the volume of the pores revealed the most important influence parameters for this study. These results revealed that the experimentation and the modeling, well correlated with Marczewski-Jaroniec, Toth, and gave the best results whatever the temperature and the material used.

Keywords : CH₄ adsorption, exchange cations, exchanged zeolite, isotherm study, NaX zeolite

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