

REMOTE DETECTION NMR GAS ADSORPTION METER

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The development of efficient methods for gas adsorption studies is extremely important for a broad range of key technologies of modern society relying, e.g., on the large storage capacity of porous materials, heterogeneous catalysis and separation as well as purification of low-relative-volatility mixtures. Standard adsorption measurement techniques are slow and require an additional compositional analysis of non-adsorbed components of the gas mixture. The aim of this study is to develop a new, fast method for the quantitative measurement of competing adsorption of gas mixtures in porous media, based on spatially resolved remote detection time-of-flight nuclear magnetic resonance (RD TOF NMR).

In the present work we are developing an optimal experimental framework and theoretical model required for TOF RD NMR investigations of single and multicomponent gases by comparing the obtained quantitative information with standard measurements of gas adsorption isotherms. A preliminary application of the model to analyze the amount of adsorbed propane when a mixture of propane, propene and hydrogen gas flowed through the microfluidic packed-bed reactor generating Parahydrogen-induced polarization (PHIP) resulted in reasonable values, implying that RD TOF NMR is a very promising method for adsorption analysis.[1] However, the conditions, such as gas mixture, temperature, pressure, sample preparation, etc., were not optimized for these preliminary measurements, resulting in very large uncertainty in the calculated values. Consequently, new sets of experiments with optimized conditions are required in order to prove the potential of the method. The first results will be presented in the poster.

[1] V. V. Zhivonitko, V.-V. Telkki, I. V. Koptyug, *Angew. Chem. Int. Ed.* 51, 8054-8058 (2012).