

The Open-Access Journal for the Basic Principles of Diffusion Theory, Experiment and Application

Selective Adsorption of H₂S on MOFs and Zeolite NaX

Bert Jentsch, Hendrik Kosslick, Henrik Lund, Jörg Harloff, Axel Schulz, Roland Matzmohr, Bertold Sprenger, Hans-Joachim Wolff

Universität Rostock, Mathematisch-naturwissenschaftliche Fakultät und Fakultät für Maschinenbau und Schiffstechnik, Albert-Einstein-Straße 2, 18059 Rostock, Germany, E-Mail: hans-joachim.wolff@uni-rostock.de

1. Introduction

Biogas up-grading requires the removal of S- and N-containing contaminants before further working up. We report here results on the ability of MOFs [1,2] to remove H₂S, the main S-contaminant, from natural wet biogas streams.

2. Experimental

The IRMOFs were synthesized solvothermally under autogeneous pressure according to the literature. Zeolite NaX was commercial. Materials were characterized by XRD and TEM. Adsorption tests were carried out in a column adsorber with streaming biogas.

3. Results

The results show that IRMOFs are able to remove nearly completely H₂S from biogas streams also in the presence of moisture. The adsorption capacity was superior to commercial zeolite NaX. TEM images reveal the high porosity of the IRMOF framework. As a result, only a very low pressure drop is observed in the sorption experiment.

First attempts are undertaken to predict mass transfer properties from experimental sorption curves

4. Conclusion

First results in the study of MOFs as adsorbents for working up of raw biogas obtained from biogas reactors confirm the potential of this new class of materials for gas separation and cleaning. Obviously, this holds also for low concentrations of H₂S.

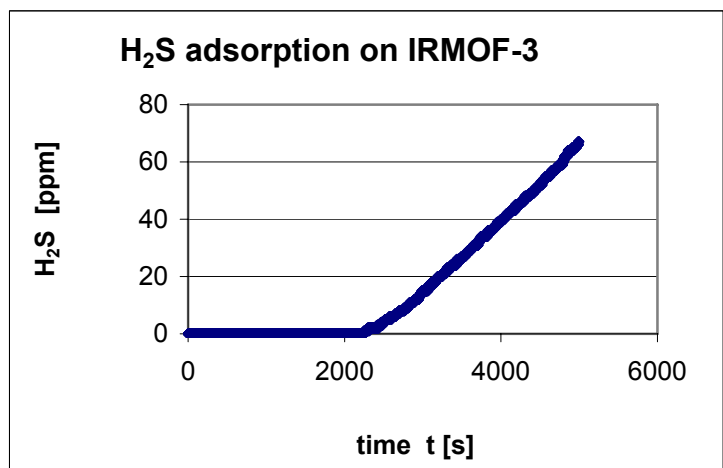
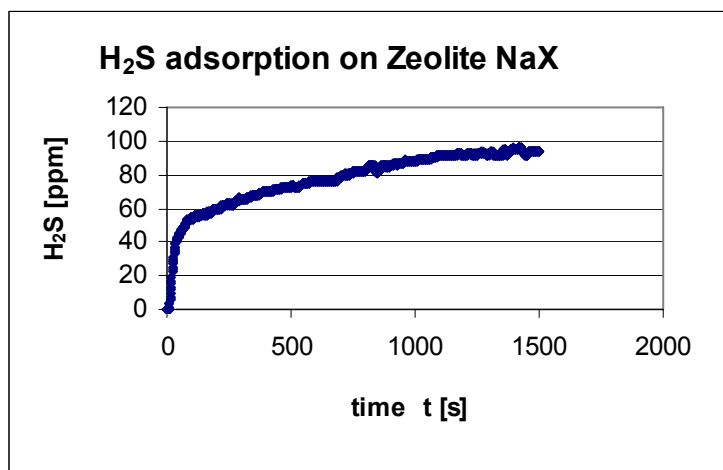


Fig.1: H₂S adsorption from natural Biogas on 1g f Zeolite X (top) and IRMOF-3 (bottom) at r.t. H₂S content: 300 ppm, gas stream through adsorber : 1L/min.

References

- [1] O. M. Yaghi, *Acc Che. Res.* 38 (2004) 176.
- [2] R. Millward and O. M. Yaghi *J. Am. Chem. Soc.* 127 (2005) 17998.