HYDROGEN STORAGE IN NANOPOROUS MATERIALS: ADVANTAGES AND LIMITATIONS

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Hydrogen storage in nanoporous materials has been attracting a great deal of attention in recent years, as high gravimetric H_2 capacities can be achieved at 77 K using materials with particularly high surface areas. Cryogenic storage by physisorption of hydrogen molecules will safely operate at low pressures, is fully reversible and possesses fast kinetics.

Experimental data of the gravimetric and volumetric hydrogen uptake have been analysed for many metal-organic frameworks (MOFs) showing a linear correlation of the gravimetric absolute uptake with the specific surface area [1] and for the volumetric absolute hydrogen uptake as a function of the volumetric surface area [2]. A phenomenological model is developed for the volumetric absolute uptake as a function of the gravimetric absolute uptake [2]. For technical applications the key parameter is the usable capacity, which is the amount of hydrogen that can be delivered between the maximum tank pressure and the back pressure required by the end-user.

The presentation will give an overview of the current status and discuss future concepts.

References

[1] M. Schlichtenmayer, M. Hirscher, J. Mater. Chem. 22, 10134 (2012)

[2] R. Balderas-Xicohténcatl et al., Energy Technol. 6, 578 (2018)

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