

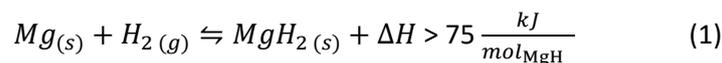
HYDROGEN SEPARATION FROM H₂/CH₄ GAS MIXTURES WITH A MAGNESIUM-BASED SYSTEM

Fabian Lange^a, Anna-Lena Woeste^a, Mateusz Balcerzak^a, Robert Urbanczyk^b, Michael Felderhoff^{*a}

- a. *Max-Planck-Institut für Kohlenforschung, Kaiser-Wilhelm-Platz 1, 45470 Mülheim an der Ruhr, Germany.*
- b. *Institut für Energie- und Umwelttechnik e. V. (IUTA), Bliersheimer Str. 58 – 60, 47229 Duisburg, Germany*

e-mail: lange@kofo.mpg.de

A limiting factor for the hydrogen infrastructure is the hydrogen transfer on a large scale. Therefore, it is possible mixing hydrogen with methane and transfer it using existing natural gas pipelines. Due to its reversible hydrogen absorption/desorption properties metal hydrides like MgH₂ are interesting materials for the separation of hydrogen from natural gas.



In this study we investigated the selective absorption of hydrogen from a CH₄/H₂ gas mixture with magnesium and 5 wt.-% nickel as a catalyst. The studies performed showed that the material is able to absorb all the hydrogen from a limited amount of gas mixture reaching 4.5 wt.-% of H₂ after 10 hydrogenation steps.^[1]

In the following studies we put our effort to develop a setup to measure the evolution of hydrogen storage capacity of magnesium over various cycles of hydrogenation and dehydrogenation in pure H₂, H₂/CH₄ and H₂/natural gas.

The reaction takes place inside a stainless steel autoclave acting as a batch-reactor, which is connected to a H₂-reservoir, a gas bottle filled with the gas-mixture and a cylinder for GC-samples. Investigation of the resulting MgH₂ is performed by XRD, TGA-DSC and GC.

Our studies show the potential of MgH₂-based systems for hydrogen separation from methane/natural gas mixtures.

[1] A.L. Woeste, M. Balcerzak, R. Urbanczyk, M. Felderhoff, Mg-Based System for H₂ Sorption from CH₄/H₂ Gas Mixture. Energy Technology 2021, 9, 2001079.



My name is Fabian Lange. I am currently studying Energy- and Environmental Sciences at the University of Applied Sciences (HRW) in Mülheim an der Ruhr/Bottrop, Germany and am doing an internship at the Max-Planck Institut für Kohlenforschung in the research group of Dr. M. Felderhoff. The topic of the internship is gas separation with metal hydride compounds.