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ENERGYPOLIS SEMINAR

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Al-N-Compounds – Possible Materials for Hydrogen Storage

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Aluminum hydride (AlH_3) by itself has already been considered as a hydrogen storage material over 50 years ago based on its high volumetric (148 g H_2 L^{-1}) and gravimetric (10.1 wt.-%) hydrogen density. Based on its low decomposition temperature and light weight, research on AlH_3 confining the impractical re-hydrogenation conditions is still in progress. Attempts to stabilize AlH_3 with a Lewis base, such as an amine, lead to a significant reduction of the thermodynamic hydrogenation barrier of Al. This approach enables the hydrogenation at room temperature and reasonable pressures to generate amine AlH_3 adducts, called amino alanes. The influence of tertiary amines leads to stabilized phases under mild conditions offering promising properties for reversible hydrogenation.

References:

[1] J. Ortmeyer, A. Bodach, L. Sandig-Predzymirska, B. Zibrowius, F. Mertens, M. Felderhoff, Direct Hydrogenation of Aluminum via Stabilization with Triethylenediamine: A Mechanochemical Approach to Synthesize the Triethylenediamine AlH_3 Adduct, ChemPhysChem, 2019, DOI: 10.1002/cphc.20180109

[2] M.B. Ley, T. Bernert, J. Ruiz-Fuertes, R. Goddard, C. Fares, C. Weidenthaler, M. Felderhoff, The plastic crystalline A15 phase of dimethylaminoalane, $[N(CH_3)_2–AlH_2]_3$, Chem. Commun. 2016, 52, 11649–11652.

CV: Dr. Michael Felderhoff
Born 1960 in Essen, Germany, after his Phd in Chemistry (University of Essen) and two postdocs in Tübingen and Osnabrück he moved to the Max-Planck-Institut in Mülheim in 1999, where he is currently a group leader in the heterogeneous catalysis department. His interests are focused on materials for hydrogen and heat storage applications and on heterogeneous catalysis under mechano-chemical activation.