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ENERGYPOLIS SEMINAR

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Interaction of hydrogen molecules with high-surface-area porous materials.

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The field of porous materials has tremendously grown, when porous coordination polymers or frameworks could be prepared with a stable and robust structure after removal of solvent molecules, exhibiting ultra-high porosity and large specific surface areas. Immediately, these novel porous materials have been extensively studied for applications in gas storage and separation.
For hydrogen storage, the maximum uptake at high pressure and 77 K shows an almost linear correlation with the specific surface area. In a storage system, two aspects have to be considered: *i*) the strength of different adsorption sites influences the operating temperature and *ii*) the density of the adsorbed layer together with the packing density dominates the maximum volumetric storage density.
A new emerging application is hydrogen isotope separation, hereby two principle mechanisms can be utilized: *i)* confinement in small pores i.e. "Kinetic Quantum Sieving" *ii)* strong adsorption sites i.e. "Chemical Affinity Quantum Sieving". For different framework materials, experimental results indicate clearly a high selectivity for separating isotope mixtures of H_2 and D_2.

Michael Hirscher

CV: Michael Hirscher
Michael Hirscher is group leader at the Max Planck Institute for Intelligent Systems, Stuttgart, Germany. He studied physics at University of Stuttgart, Germany and at Oregon State University, Corvallis, USA. For his achievements during his PhD studies in Stuttgart he was awarded the Otto Hahn Medal of the Max Planck Society in 1988. Prior to taking his position in Stuttgart, he spent a post-doctoral fellowship at the University of Pennsylvania, Philadelphia, USA. Since 2013 he is Operating Agent of Task 32 "Hydrogen-based Energy Storage" in the Hydrogen Implementation Agreement of the IEA. Last year he received Hydrogen & Energy Award 2015 in Switzerland.