

# Nanomaterials for hydrogen production and storage

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Hydrogen sorption and storage in amorphous and nanocrystalline materials is still an intriguing issue. The present lecture gives an overview on the development of this subject during the last years in the Faculty of chemistry and pharmacy. Amorphous and nanostructured alloys and composites on the base of magnesium, zirconium and titanium are synthesized by rapid quenching from the melt and by ball-milling. Through alloying and variation of the preparation conditions materials with different microstructure were synthesized. Their morphology, structure and microstructure have been characterized by x-ray and electron diffraction, and electron microscopy. The thermal behavior of the metastable and unstable materials as well as the thermodynamics and kinetics of their phase transformations during annealing were studied by differential scanning calorimetry and differential thermal analysis. The hydrogen absorption/desorption and hydriding/dehydriding thermodynamics and kinetics of the materials have been studied applying high pressure DSC, Sieverts type volumetric and electrochemical methods. Conclusions have been made on the structure-hydriding properties relationship and on the approaches to optimize the alloys microstructure with respect to achieve their improved hydrogen storage performance.