HYDROGEN STORAGE IN METALIIC MATERIALS ON BASIS OF MAGNESIUM

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Hydrogen is a very prospective and “eco-friendly” fuel which can bring economic and environmental benefits. However, operation with hydrogen is hazardous due to its extremely high flammability. Nevertheless, the advantages of hydrogen economy remain a permanent challenge and hence, new ways are sought that could lower hazards as much as possible.

One of technology issues that impede expected future hydrogen economy is the lack of safe, efficient and economic hydrogen storage (HS). At present, there are two main ways how to store hydrogen: compression of gaseous hydrogen and liquefaction. None of these storage techniques is sufficiently efficient and free of hazards – especially for mobile applications. It appeared that hydrogen can be stored in solids, where surprisingly high gravimetric and volumetric density can be reached. Many HS materials were investigated that store hydrogen either by physisorption or by chemisorption. Unfortunately up to now, none of them showed sorption characteristics that would fulfil all demands of technical practice. Our group is involved in research of perspective chemisorbants mainly based on Mg.

Magnesium is one of prospective storage material because of their high theoretical hydrogen storage capacity (7.6 wt.%), volumetric capacity (110 g L^{-1}), the highest energy density of all reversible hydrides (9 MJ kg^{-1}), Earth abundance and low cost. However, pure magnesium has poor sorption properties. In recent years, the kinetics of sorption properties of magnesium-based materials has been significantly improved. In respect of too high thermodynamic stability of Mg hydrides, which hinder the operation at low temperatures, only moderate success was reported in the literature. Very interesting results were achieved with materials prepared by reactive milling and doped by effective catalysts. However, the kinetics of hydrogen desorption under about 250°C remains an open issue.