

The main objective of the project is to develop a lightweight lithium alloys with single- and multi-walled carbon nanotubes (SWCNT and MWCNT) for hydrogen storage, high capacity (> 6 wt.%) and the development of combinatorial synthesis for hydrides as prospective materials for devices to storage and storage hydrogen as a fuel of the future.

The evolution on the energy market of natural resources (ie. crude oil, natural gas, et al.), and forecasts of energy needs make it necessary to seek new alternative sources of energy. The biggest hope is hydrogen as a fuel of the future. The reason for this is significant energy (about 120 MJ / kg) obtained by combustion of hydrogen and the absence of any impurities (by-product is only water). But there isn't a big problem with its storage and transport in gaseous form. Pressure vessels are large, contain gas under high pressure and are dangerous. Storage of hydrogen in liquid form requires a very low temperature and additional costs for the liquefaction.

Storage the hydrogen in the solid materials is safe and effective way to store energy. This type of cell can be used both for stationary and mobile equipment.

Now very prospective solution is hydrogen storage by adsorption in solids (alloys, composites, etc.). The main requirements for modern materials for hydrogen storage in the automotive industry are: high gravimetric density, easy absorption / desorption of hydrogen at normal temperatures and pressures, low price of materials and their ecological safety. Conventional hydrides, such as LaNi_5H_6 and derivatives of zirconium and titanium alloys are commonly used in hydrogen storage systems have the storage capacity of less than 2% by weight of hydrogen. Four major groups of suitable materials include: carbon and other materials with high surface areas (nanotubes, graphite nanofibers, zeolites, etc.), Reactive chemical hydrides, complex hydrides, for example: allantoin and alloys or intermetallic compounds.

So far, multicomponent lithium alloys containing elements p- and d-electron, as materials for hydrogen storage haven't been studied in the world. Initial studies made by applicants have shown a very positive impact elements of d- and p-electron corrosion resistance and extends the life of storage materials for hydrogen. Our proposed test procedure (synthesis-phase composition-crystal structure and electronic and an absorptive properties and catalytic) will nominate the most optimal compositions of alloys for practical use.