Abstract

The doctoral dissertation introduces issues related to the use of hydrogen as a source of energy, methods of its storage with particular reference to metal hydrides and shows the current state of knowledge about the alloys of the Sm-Co and Gd-Co systems.

As part of the main objective of the work, new alloys of the Sm-Co-M and Gd-Co-M systems were obtained, where M = Li, Mg, Al, Si, and Sn. Phase analysis was performed using X-ray powder diffractometry and quantitative analysis using electron microscopy and EDS analysis (Energy Dispersive X-ray Spectroscopy). The materials characterized in this way have been subjected to electrochemical tests in the system 2-electrode (cyclic-voltamperometry) and 3-electrode to assess their corrosion resistance and hydrogen absorption capacity. Selected alloys were also tested for sorption / desorption of hydrogen in the gas phase (Sievert's method).

The newly obtained alloys contained the A_2B_{17} or AB_5 phase or a mixture of these phases, and each of the compounds obtained was able to efficiently absorb hydrogen. All of these compounds exhibit high operational stability in electrochemical tests and fairly good corrosion resistance. Introduction of additions of elements: aluminum and lithium as well as magnesium and lithium caused an increase in the amount of hydrogen absorbed in Sm-Co alloys. In the case of Gd-Co compounds, a positive effect caused the introduction of small amounts of silicon, aluminum or tin.

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