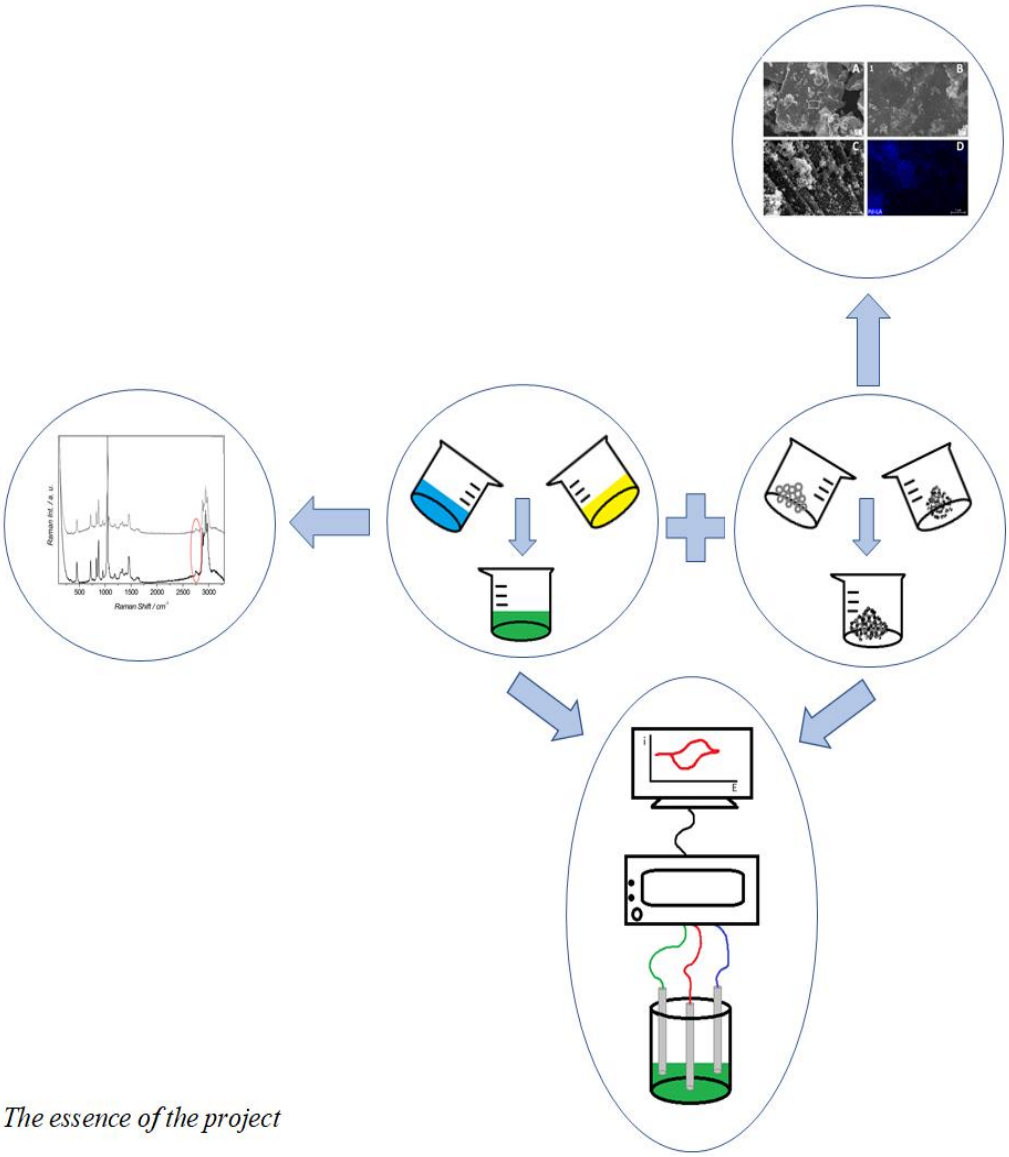
The constant demand on energy, in dynamically developing world, causes that searching of new sources of energy is necessary. The idea to use a hydrogen, considered increasingly as an universal, high- and clean energy carrier, faces a number of difficulties. The significant drawback in the common utilization of hydrogen is the risk of explosion connected with its storage in the gas or liquid form. Therefore, the best solution seems to be hydrogen storage in a form of hydrides. Metal hydrides work as a anode in rechargeable nickel-metal hydride batteries (Ni-MH).



The essence of the project

Currently used Ni-MH batteries are significantly inferior to lithium-ion (Li-ion) batteries. Many years of studies on Ni-MH batteries show that no modification of the anode material or electrolyte used so far has not increased the competitiveness of Ni-MH cells in relation to Li-ion batteries. This is due to the fact that the main source of limitations in the operation parameters of hydride batteries is the decomposition of water and the significant corrosion of the anode material associated with the use of an electrolyte based on a concentrated base. A promising solution is the use of electrolytes based on ionic liquids.

The main goal of the project is the synthesis of ionic liquids dedicated for use in rechargeable hydrogen storage systems. The synthesized ionic liquids and their mixtures with concentrated potassium hydroxide will be used as electrolytes in the testing of the hydrogen sorption properties of materials conventionally used in hydride batteries such as AB_5 or AB_2 alloys as well as in high hydrogen capacity alloys such as magnesium and zirconium/titanium AB_3/A_2B_7 alloys. In addition, the aforementioned materials will be modified with palladium (Pd) nanoparticles, which will accelerate the hydrogen electrosorption process and reduce the time of the anode activation. As a part of the project, the hydrogen absorbing properties of Pd-modified and unmodified anode materials in ionic liquids-based electrolytes, as well as the corrosive properties of the examined systems will be characterized. The project will be implemented by a consortium combining the potential of electrochemists and synthetics from the Faculty of Chemistry of the University of Warsaw and the Faculty of Chemical Technology of Poznan University of Technology in cooperation with the Norwegian Institute for Energy Technology (IFE). The final result of the project will be the development of a system (anode material/ionic liquid-based electrolyte) that is a compromise between the best anti-corrosive and hydrogen storage properties. It is expected to obtain a safe system with high hydrogen capacity and long cycle life. The objectives of the project will be achieved with the use of advanced electrochemical and physicochemical techniques.