

HyCARE: Hydrogen Carrier for Renewable Energy storage

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Renewable energies, such as photovoltaic and wind power, are characterized by intermittent production. For this reason, the storage of energy is necessary for an efficient management of renewable energy. Among several solutions proposed, the use of hydrogen as energy carrier is under investigation.^{1,2} Compared to batteries, hydrogen allows storing large amounts of energy in small volumes, over long-time, *i.e.* no self-discharge issues, with low environmental impact.³ Hydrogen can be produced using renewable energies by electrolysis, which splits water into hydrogen and oxygen. The produced hydrogen is stored, and it can then be converted back into electrical energy by means of a fuel cell. Hydrogen can be absorbed in the form of a metallic hydride under mild conditions, *i.e.* close to room temperatures and atmospheric pressure. This solution ensures safe storage and reduces the volume required for storing even large quantities of hydrogen. Hydrogen storage remains a challenge and the HyCARE project, supported by the European Fuel Cells and Hydrogen Joint Undertaking (grant agreement No 826352), plans to address it. The project involves the production of 5 tons of metal alloy, which will fill special containers for large-scale stationary hydrogen storage. The thermal management of the plant will take place through an innovative approach, making use of phase change materials, significantly increasing the efficiency of the process. The amount of stored hydrogen will be at least 50 kg, which will represent the highest quantity ever stored in Europe with this technique. The consortium is led by the University of Turin, together with the Environment Park, and sees the presence of a large metallic powder producer (GKN Sinter Metals) and the French energy multinational company Engie, which will make its site in Paris available for the demonstration. The plant will be built by two small-medium enterprises, a German (Stühff) and an Italian (Tecnodelta) one. Four research centers will also support the project: the Italian Bruno Kessler Foundation of Trento, the French CNRS, the Helmholtz-Zentrum Geesthacht in Germany and the Norwegian Institute for Energy Technology at Kjeller.

The lab-scale experimental studies and theoretical modelling on metal hydrides, performed last years in European laboratories, will find a promising application at a large scale. The concept and the research behind the project will be presented and discussed.

References

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