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## **HYDRIDE4MOBILITY: an EU HORIZON 2020 project on hydrogen powered fuel cell utility vehicles using metal hydrides in hydrogen storage and refuelling systems**

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The goal of the EU Horizon 2020 RISE project 778307 “Hydrogen fuelled utility vehicles and their support systems utilising metal hydrides” (HYDRIDE4MOBILITY) (RISE project), is in addressing critical issues towards a commercial implementation of hydrogen powered forklifts using metal hydride (MH) based hydrogen storage and PEM fuel cells, together with the systems for their refuelling at industrial customers facilities. For these applications, high specific weight of the metallic hydrides has an added value, as it allows counterbalancing of a vehicle with no extra cost. Improving the rates of H<sub>2</sub> charge / discharge in MH on the materials and system level, simplification of the design and reducing the system cost, together with improvement of the efficiency of system “MH store-FC”, is the goal of the work.

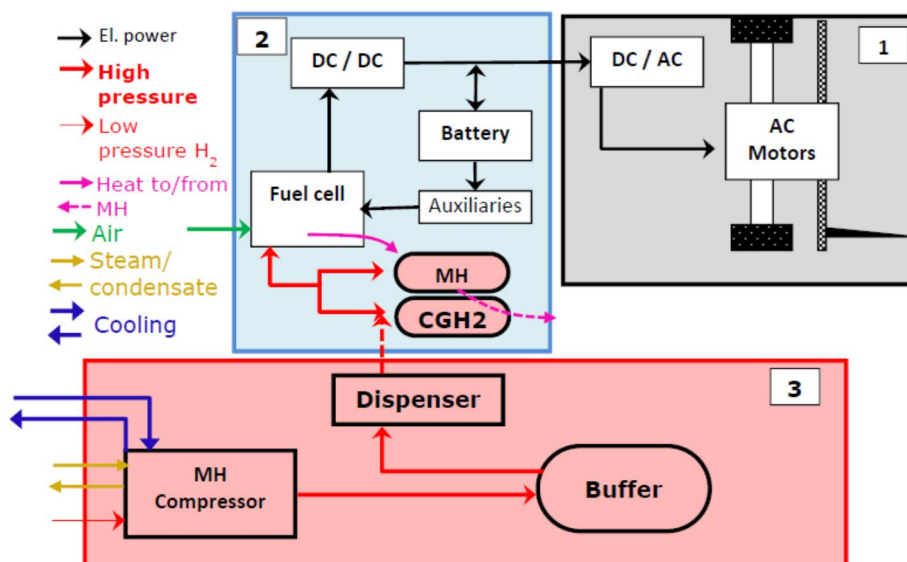
The work is a joint effort of consortium uniting academic teams and industrial partners from two EU and associated countries Member States (Norway, Germany, Croatia), and two partner countries (South Africa and Indonesia). The technology is validated by a project partner Implats where a hydrogen driven forklift is in operation. An interest to collaborate on the topic from industrial partners in Germany (Stühff GmbH and STILL GmbH, a forklift manufacturer) is in place. The HYDRIDE4MOBILITY project will allow to implement MH based technologies for use in transportation and will promote their commercialisation in the European countries.

The work within the project is focused on the validation of various efficient and cost-competitive solutions including (i) advanced MH materials for hydrogen storage and compression, (ii) advanced MH containers characterised by improved charge-discharge dynamic performance and ability to be mass produced, (iii) integrated hydrogen storage and compression / refuelling

systems which are developed and tested together with PEM fuel cells during the collaborative efforts of the consortium with a strong and comprehensive expertise in materials science of metal hydrides, manufacturing of the advanced hydrogen storage materials, design and manufacturing of gas sorption reactors, fuel cell system integration, as well as manufacturing of the fuel cell power modules for utility vehicles and systems with integrated MH compressor for their refuelling with hydrogen.

A general system concept implemented at Implats plant in a fuel cell powered forklift with on-board MH hydrogen storage and on-site refuelling by hydrogen gas is shown in Figure 1. The system consists of a utility vehicle (1) utilising hybrid (fuel cell + battery) power module (2) with an integrated MH hydrogen storage system. The stationary hydrogen refuelling system (3) consists of a low-pressure hydrogen supply and a MH hydrogen compressor, which provide a periodic refuelling of the on-board H storage system in the power module (2).

This presentation gives an overview of HYDRIDE4MOBILITY project focused on the results generated during its first phase (2017–2019). Additional details are presented on the project website <http://hydride4mobility.fesb.unist.hr/>



**Figure 1:** General system concept being implemented within HYDRIDE4MOBILITY project.

The focus of the presentation is on the materials science of zirconium and titanium-based metal hydrides alloys allowing advanced performance in storage and compression systems.

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