

TiFe intermetallics for large-scale stationary hydrogen storage

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The intermittency of renewable sources requires the use of storage systems to equilibrate energy production and demand. The European project HyCARE (www.hycare-project.eu/), running from 2019 to 2022, aims to demonstrate the efficient use of metal hydrides, coupled with phase change materials, to store 50 kg of hydrogen, one of the highest quantity ever handled in Europe by solid-state hydrogen storage. Among the 10 partners of the HyCARE consortium, coordinated by the University of Turin, ICMPE (CNRS) leads the tailoring and optimization of the alloy composition. It includes alloy design, tuning to thermodynamic operational conditions, activation and kinetic issues, as well as cycling stability, resistance to impurities and limited use of raw critical materials. Low-cost TiFe-based intermetallics have been selected. Composition and microstructure are optimized, and their hydrogen properties deeply characterized by many-fold techniques in terms of thermodynamics, activation, kinetics, cycle-life as well as reversible hydrogen uptake by *in-situ* neutron diffraction.

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