Static and Dynamic Performance Tests on Room Temperature Hydride Tank

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This experimental work deals with the feasibility of a vehicular hydrogen tank system, using a commercial interstitial metal hydride as storage material. The tank was designed to feed a fuel cell in a light prototype vehicle and the material, Hydralloy C5 by GfE, was expected to be able to absorb and desorb hydrogen in a range of pressure suitable for that. A systematic analysis of the material in laboratory scale is useful to make an extrapolation of the thermodynamic and reaction kinetics data. The development of the tank was done according to the requirements of the prototype vehicle propulsion system.

The task for static tests (measurements with automatic flow control and constant settings) is to evaluate wether the requirements for desorption are met by this tank set-up. Moreover the settings for the most convenient reloading of the tank were experimented.

The following step was the design and the application of dynamic tests, where the requirements were still met and the hydrogen flow, provided by the tank, was fluctuating following a hypothetical on-road test. It was possible to underline the thermal issues of high-demanding performances and to propose a solution for that. Different cycles were performed on the tank to find the ideal setting for high average and peak flow in a realistic experiment.

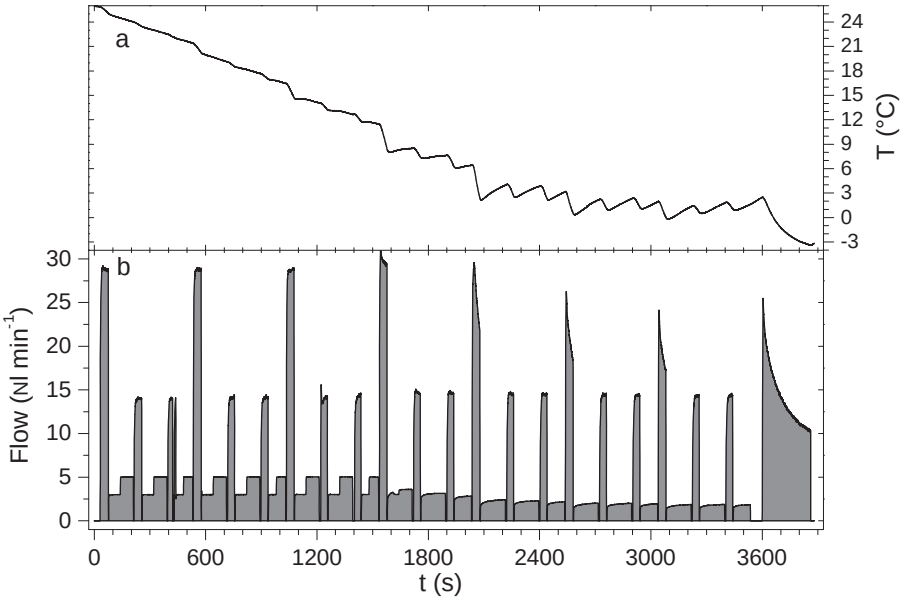

Figure 1. Dynamic test cycle: average temperature of the tank (a) and hydrogen flow (b).