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Expansion behavior of high-capacity complex hydrides

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High-capacity complex hydrides like sodium alanate and the Reactive Hydride Composites have been intensively studied in the last years as possible hydrogen storage materials for different applications due to their inherent compactness and low pressure operation. However, the research has been hitherto mostly concentrated on lab-scale, microscopic properties.

In order for these materials to be used in commercial scale, their macroscopic, pilot-plant scale behavior needs to be investigated. In particular, the fact that they experience radical chemical transformations during charging and discharging with hydrogen means that beds made of the hydrides will change considerably during operation. One of the most important changes regarding tank construction is the one affecting density. Samples of these materials (and similar ones) have been known to decrepitate under repeated contact with hydrogen, because of the repeated density changes. The hydrogen absorbing materials (may) expand, leading to increased stresses on the tank hull.

In order to study this behavior in the high-capacity complex hydrides as well as magnitude of the developing stresses on a potential tank shell, this project will measure samples of powder and/or pellets in the cell available within the H2FC. The macroscopic expansion and the stresses thus generated will be evaluated and recorded, giving valuable information for the design of tank systems based on them.