

## Hydrogen/Deuterium Charging Methods for the Investigation of Site-Specific Microstructural Features by Atom Probe Tomography

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The ingress of hydrogen into metallic materials leads to the degradation in their mechanical properties which is referred to as hydrogen embrittlement. We are working on understanding the hydrogen embrittlement susceptibility of a high manganese twinning induced plasticity steel (TWIP) with a composition of Fe 28Mn 0.3C (wt. %). In order to investigate the interaction of hydrogen with specific microstructural features in the studied TWIP steel, we needed to develop ways of charging the site-specific APT specimens with deuterium containing a certain specific microstructural feature, such as a grain boundary or a stacking fault, but it is technically very challenging.

We have developed two different charging methods for charging the site-specific APT specimens with deuterium: cathodic hydrogen charging and gas charging in a gas charging chamber known as the “Reacthub Module”. Both these charging methods have their own advantages and drawbacks which will be showcased in the presentation. During this talk, I will describe in detail the different set ups and discuss the involved cryogenic transfer workflows, while presenting the preliminary results from different approaches.