

New Tools & New Insights: Unravelling Hydrogen Effects in Structural Alloys

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Hydrogen uptake can create significant embrittlement effects in high strength alloys. Underlying mechanisms are complex, due to the involved spatial and temporal scales. Over the last years, we have been developing novel in-situ scanning electron microscopy techniques, to explore and better understand hydrogen effects in titanium alloys, steels and high entropy alloys. These techniques enable integrated imaging, spectroscopy and micro-mechanical testing, during hydrogen charging. In this talk, I'd like to provide an overview of these techniques, as well as the insights we have achieved regarding the microstructural causes of embrittlement in these alloys. More specifically, hydride formation mechanisms and kinetics in titanium alloys, and hydrogen induced dislocation activity in steels and high entropy alloys will be discussed.