

## **Multiscale Modeling of Hydrogen Embrittlement of Metals**

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Hydrogen embrittlement is one of the most pervasive problems in materials science and engineering as almost all metals and their alloys suffer to some extent of the H-induced brittleness. However, despite intense research efforts in the past four decades, a complete mechanistic understanding of H embrittlement still eludes us. For the most part, the challenges stem from the multiscale nature of the problem. In this talk, we discuss recent progresses in multiscale modeling of H embrittlement, focusing on three crucial problems - H enhanced local plasticity, H induced void formation and H assisted cracking. The discussion is organized around the synergy between the experimental and theoretical efforts, the elucidation of the competing mechanisms as well as the open questions. The necessity of multiscale simulations is illustrated in the context of their successes and failures for understanding H embrittlement. The challenges for future development of multiscale approaches are briefly addressed.