

MM 48: Invited Talk (Hauptvortrag): Barnoush

Time: Thursday 9:30–10:00

Location: H24

Invited Talk

MM 48.1 Thu 9:30 H24

Hydrogen embrittlement revisited by novel nano-mechanical approach — ●AFROOZ BARNOUSH^{1,2}, MOHAMMAD ZAMANZADE², MASOUD ASGARI¹, ROY JOHNSEN¹, and HORST VEHOFF² —
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Despite hydrogen embrittlement is known for more than a century a clear explanation of the governing mechanism is still missing. This is mainly due to the complexities of the experimental examination of hydrogen embrittlement. On the basis of these complexities a novel experimental approach, in situ electrochemical nanoindentation (ECNI),

is developed. ECNI is capable of registering the onset of plasticity in extremely small volumes which can consider as perfect crystals in hydrogen free and charged conditions. It is shown that hydrogen reduces the required stress for the onset of plasticity due to reduction in the dislocation line energy. This reduction in dislocation line is explained by the Defactant Concept, i.e. reduction of the defect formation energy in the presence of hydrogen. The extent of the reduction in the dislocation line energy measured during nanoindentation can be successfully used to evaluate the intrinsic resistivity of the examined alloy or metal against hydrogen embrittlement. This makes ECNI a versatile technique for development of new hydrogen resistant alloys or coatings.