

Hydrogen-Material-Interaction – the Good, the Bad, and the Ugly

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Hydrogen plays an important role in our energy landscape, and there is an urgent need to significantly progress our understanding of structural and functional hydrogen-material interactions. These aspects become more-&-more important when, for example, maximizing efficiencies for hydrogen synthesis in electrolyzers, controlling catalytic surface-material interactions, and the design of tailored permeation barrier surfaces or coatings. Challenges exist across the hydrogen value chain that need to be addressed. My presentation will address the full spectrum of hydrogen-material interactions, including positive aspects of hydrogen in materials, why so many opportunities exist in dealing with hydrogen, its negative flaws and challenges, and the unpleasant hydrogen embrittlement part. New, innovative ways to better understand hydrogen-material interactions will be introduced. The presentation aims to stimulate a discussion around developing new approaches and ideas to look at and assess hydrogen-material interactions. This includes using simple hydrogen-absorption and effusion observations on steel and stainless steel surfaces, followed by the application of electrochemical techniques to stimulate and de-stimulate hydrogen absorption in steels and stainless steels