

**Title**      **Hydrogen affecting defect density  
and mobility in metals and vice versa**

**Speaker** Prof. Reiner Kirchheim  
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**Time&  
Date**      4:00 PM(JST), Wednesday, July 20th, 2022



### Abstract

Defects like vacancies, dislocations and grain boundaries are discontinuities of the crystal lattice and may attract dissolved hydrogen atoms leading to a distribution of site energies and a higher solubility of hydrogen at a given partial pressure of hydrogen gas. On the other hand hydrogen atoms at discontinuities may either enhance or retard defect motion. Hydrogen also affects the generation of defects reducing their formation energies to zero or even negative values, which is the main reason for hydrogen embrittlement of metals or more generally the plastic response of metals under external stress. It will be shown that other solutes as carbon, nitrogen and oxygen act the same as hydrogen on the defect generation. Solute atoms reducing defect formation energies will be called defactants (defect acting agents) in analogy to surfactants (surface acting agents) reducing surface formation energies. The basic physico-chemical laws describing this behavior of hydrogen are presented together with examples of experiments, where these laws are verified or play a major role.

### About the Speaker

Reiner Kirchheim is a Distinguished Professor of Lower Saxonia at the University of Goettingen and an external member of the Max-Planck-Institute for Iron Research in Duesseldorf. He worked at the Max-Planck-Institute for Metals Research as a research scientist and senior group leader from 1971 until 1993 and received his PhD in physics from the University of Stuttgart in 1973. From 1993 to 2008 he was the director of the Institute for Materials Physics at the University of Goettingen. Prof. Kirchheim is known for his research in thermodynamics and kinetics of materials. He is a member of the Goettingen Academy of Science, the German National Academy of Technical Sciences (acatech) and the US National Academy of Engineering (NAE) and the recipient of the Carl Wagner Prize 1990, the Honda Memorial Award 2003, the Heyn Memorial Medal 2005, the Lee Hsun Lecture Award 2007, the Staudinger-Durrer Lecture at ETH-Zurich and the Talbot Distinguished Lecture at UI Urbana/Champaign.

**Registration**    [https://zoom.us/webinar/register/WN\\_gw94nOcwSgq\\_54jfAQL8UA](https://zoom.us/webinar/register/WN_gw94nOcwSgq_54jfAQL8UA)

**Host**          Prof. Masanobu Kubota

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