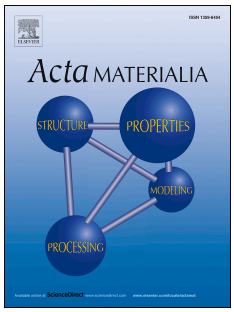
Accepted Manuscript



Spatially resolved localization and characterization of trapped hydrogen in zero to three dimensional defects inside ferritic steel

Waldemar Krieger, Sergiy V. Merzlikin, Asif Bashir, Agnieszka Szczepaniak, Hauke Springer, Michael Rohwerder

PII: S1359-6454(17)30932-1

DOI: 10.1016/j.actamat.2017.10.066

Reference: AM 14165

To appear in: *Acta Materialia*

Please cite this article as: Waldemar Krieger, Sergiy V. Merzlikin, Asif Bashir, Agnieszka Szczepaniak, Hauke Springer, Michael Rohwerder, Spatially resolved localization and characterization of trapped hydrogen in zero to three dimensional defects inside ferritic steel, *Acta Materialia* (2017), doi: 10.1016/j.actamat.2017.10.066

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Spatially resolved localization and characterization of trapped hydrogen in zero to three dimensional defects inside ferritic steel

Waldemar Krieger[1], Sergiy V. Merzlikin[1,*], Asif Bashir[1], Agnieszka Szczepaniak[1], Hauke Springer[1] and Michael Rohwerder[1]

[1]Max Planck Institute for Iron Research, Max-Planck-Str. 1, 40237 Düsseldorf, Germany

[*]corresponding author: s.merzlikin@mpie.de

Keywords: high strength steel, hydrogen, trapping, activation energy, traps, hydrogen embrittlement, thermal desorption spectroscopy, scanning Kelvin probe, SKPFM, ferritic steel

Abstract

In this work, localized hydrogen (H) detection measurements were conducted on a model ferritic (Fe 5 wt.-% Ni) steel which enables a systematic study of 0- (vacancies), 1- (dislocations), 2- (grain boundaries) and 3- (inclusions) dimensional deffects, induced by varying mechanical and thermal treatments, without changing the chemical composition of the material.

Spatially resolved detection with Scanning Kelvin Probe Force Microscopy (SKPFM) as an electrochemical technique with a resolution on a nanometric scale in combination with Thermal Desorption Spectroscopy (TDS) and microstructure characterization using electron microscopy indicated a domination of at least two trapping sites. Step by step the dominating H trapping sites were identified as dislocations and vacancies with estimated desorption energies of 29±5 and 38±5 $kJ \cdot mol^{-1}$. Furthermore, voids, inclusions and their interface to the matrix where found to be trapping sites binding low

Download English Version:

https://daneshyari.com/en/article/7876902

Download Persian Version:

https://daneshyari.com/article/7876902

Daneshyari.com