

## CONTENTS

### SOLUBILITY AND OTHER THERMODYNAMIC PROPERTIES

Solid Solutions of Pd Containing Hydrogen and a Noble Metal Substitutional Component — I. Thermodynamic Behavior <b>M. Yoshihara and R. B. McLellan</b>	3
Solid Solutions of Pd Containing Hydrogen and a Noble Metal Substitutional Component — II. Kinetic Behavior <b>M. Yoshihara and R. B. McLellan</b>	9
Cell Models for Interstitial Solid Solutions <b>R. B. McLellan</b>	15
Thermodynamics of Pd-Cu-H Solid Solutions <b>M. Yoshihara and R. B. McLellan</b>	21
Overview No. 27: The Solubility and Diffusivity of Hydrogen in Well-Annealed and Deformed Iron <b>K. Kiuchi and R. B. McLellan</b>	29
Thermodynamics of Hydrogen in Iron <b>R. B. McLellan</b>	53
Thermodynamics of the Hydrogen-Nickel System <b>R. B. McLellan and P. L. Sutter</b>	57
Thermodynamic Functions in Dilute Pd-H Solid Solutions <b>R. B. McLellan and Y. Suzuki</b>	65
The Thermodynamics of Pd-Ag-H Ternary Solid Solutions <b>M. Yoshihara and R. B. McLellan</b>	69
The Thermodynamics of Ternary Palladium-Based Solid Solutions containing Nickel and Hydrogen <b>M. Yoshihara and R. B. McLellan</b>	77
Strain Fields of Hydrogen Atoms in Iron <b>T.-Y. Zhang, W.-Y. Chu and C.-M. Hsiao</b>	85
Strain Field of Hydrogen in Alpha-Fe under Boltzmann Distribution <b>T.-Y. Zhang, W.-Y. Chu and C.-M. Hsiao</b>	91
Hydrogen Adsorption in Fe, Nb and Pd <b>R. Kirchheim and J. P. Hirth</b>	95
Hydrogen in Deformed and Amorphous Pd <sub>80</sub> Si <sub>20</sub> Compared to Hydrogen in Deformed and Crystalline Palladium <b>R. Kirchheim, A. Szokefalvi-Nagy, U. Stolz and A. Speitling</b>	99

Thermodynamics of the Solid Solution of Hydrogen in Beta-Titanium Alloys <b>J. F. Lynch and J. Tanaka</b>	103
Solvus Thermodynamics of Metal-Hydrogen Interstitial Solutions <b>T. B. Flanagan, W. A. Oates and S. Kishimoto</b>	113
The Solvus Behaviour of Tantalum-Hydrogen (Deuterium) System <b>T. B. Flanagan, T. Schober and H. Wenzl</b>	121
Solvus Behaviour of Vanadium-Hydrogen and Deuterium Systems <b>T. B. Flanagan, T. Schober and H. Wenzl</b>	127
The Terminal Solubility of Hydrogen in Niobium-Tantalum Alloys <b>W. A. Oates and T. B. Flanagan</b>	135
Lattice Dilatation of Iron by Dissolved Deuterium <b>H. Hagi and Y. Hayashi</b>	141
A Work Function-Chemisorption Study of Hydrogen on Iron: Kinetics and Strain Effects <b>R. W. Pascoe and P. J. Ficalora</b>	145
A Model Calculation of the Nelson Curves for Hydrogen Attack <b>H-M. Shih and H. H. Johnson</b>	163
Elastic and Plastic Accommodation Effects on Metal-Hydride Solubility <b>M. P. Puls</b>	173
Dilatation of H.C.P. Zirconium by Interstitial Deuterium <b>S. R. MacEwen, C. E. Coleman, C. E. Ells and J. Faber, Jr.</b>	185
<b>DIFFUSIVITY</b>	
Overview No. 29: A General Mathematical Description of Hydrogen Diffusion in Steels — 1 <b>J. B. Leblond and D. Dubois</b>	193
Overview No 29: A General Mathematical Description of Hydrogen Diffusion in Steels — 2 <b>J. B. Leblond and D. Dubois</b>	205
The Diffusivity of Hydrogen in Palladium-Based Solid Solutions <b>M. Yoshihara and R. B. McLellan</b>	213
The Diffusivity of Hydrogen in Nickel at Low Temperatures <b>K. A. Lee and R. B. McLellan</b>	221
Diffusion of Light Interstitials through Non-uniformly Distributed Traps <b>R-W. Lin and H. H. Johnson</b>	225
Low Frequency Internal Friction Study of V-H, Nb-H and Ta-H Alloys — I <b>O. Yoshinari and M. Koiwa</b>	235
Low Frequency Internal Friction Study of V-H, Nb-H and Ta-H Alloys — II <b>O. Yoshinari and M. Koiwa</b>	243

A Demonstration of Dislocation Transport of Hydrogen in Iron <b>C. Hwang and I. M. Bernstein</b>	249
Hydrogen Diffusivity in High Purity Alpha-Iron <b>M. Nagano, Y. Hayashi, N. Ohtani, M. Isshiki and K. Igaki</b>	255
Diffusion of Hydrogen in B.C.C. Metals <b>Y. Sakamoto, K. Baba and T. Suehiro</b>	259
Effect of Joule Heating in Electrochemical Measurement of Hydrogen Transport <b>R-W. Lin and H. H. Johnson</b>	263
<b>STRESS-INDUCED DIFFUSION AND INTERNAL FRICTION</b>	
On the Physical Models of the Cold-Work (Snoek-Köster) Internal-Friction Peaks in BCC Metals <b>T. S. Kê</b>	271
The Cold Work Peak <b>G. Schoeck</b>	279
The Kink-Pair-Formation Theory of the Snoek-Köster Relaxation <b>A. Seeger</b>	287
Core Diffusion, Unpinning and the Snoek-Köster Relaxation <b>I. G. Ritchie</b>	295
Deformation Temperature, Orientation and Hydrogen Effects on the Low Temperature Internal Friction Peaks in Vanadium Single Crystals <b>H. Mizubayashi, S. Amano, S. Okuda and M. Shimada</b>	301
Hydrogen Related Internal Friction Peaks in Amorphous and Crystallized Pd-Cu-Si Alloys <b>O. Yoshinari, M. Koiwa, A. Inoue and T. Masumoto</b>	307
Surface Ultrasonic Studies of Time-Dependent Dislocation Pinning by H Atoms in F.C.C. Stainless Alloys <b>A. Zielinski and N. F. Fiore</b>	317
Gorsky Effect Measurements on Amorphous Pd <sub>80</sub> Si <sub>20</sub> H <sub>x</sub> between 290 and 490 K <b>A. H. Verbruggen, R. C. van den Heuvel, R. Griessen and H. U. Kunzi</b>	323
Effect of Hydrogen Charging Conditions on Internal Friction of Austenitic Stainless Steel <b>A. Zielinski</b>	329
A Hydrogen Peak of Internal Friction and its Isotope Effect in Austenitic Stainless Steel <b>S. Asano and M. Kazaoka</b>	333
An Internal Friction Peak Caused by Hydrogen in FCC Iron-Nickel Alloys <b>S. Asano and H. Seki</b>	337

The Effect of Hydrogen Solubility on the Internal Friction of V-Ti Alloys <b>C. V. Owen and O. Buck</b>	341
Hydrogen-Related Internal Friction Peak in the A15 Compound Nb <sub>3</sub> Sn <b>B. S. Berry, W. C. Pritchett and J. F. Bussière</b>	343
The Hydrogen-Induced Cold Work Peak of Internal Friction in Fe-Cr Alloys <b>S. Asano and M. Shibata</b>	349
TRAPPING OF HYDROGEN BY DEFECTS	
Interaction of Hydrogen with Dislocations in Palladium — I: Activity and Diffusivity and their Phenomenological Interpretation <b>R. Kirchheim</b>	355
Interaction of Hydrogen with Dislocations in Palladium — II: Interpretation of Activity Results by a Fermi-Dirac Distribution <b>R. Kirchheim</b>	365
More Evidence for the Formation of a Dense Cottrell Cloud of Hydrogen (Hydride) at Dislocations in Niobium and Palladium <b>J. A. Rodrigues and R. Kirchheim</b>	375
Trapping of Hydrogen by Substitutional and Interstitial Impurities in Alpha-Iron <b>A. I. Shirley and C. K. Hall</b>	381
Trapping of Hydrogen by Oxygen and Nitrogen Impurities in Niobium, Vanadium and Tantalum <b>A. I. Shirley, C. K. Hall and M. J. Prince</b>	387
Trapping of Hydrogen by Metallic Substitutional Impurities in Niobium, Vanadium and Tantalum <b>A. I. Shirley and C. K. Hall</b>	395
A more Generalized Analysis of Hydrogen Trapping <b>M. Iino</b>	403
Analysis of Irreversible Hydrogen Trapping <b>M. Iino</b>	413
Hydrogen Trapping by TiC Particles in Iron <b>H. G. Lee and Jai-Young Lee</b>	421
The Interaction of Hydrogen with Dislocations <b>Gye-Won Hong and Jai-Young Lee</b>	427
Surface and Grain Boundary Segregation of Deuterium in Nickel <b>H. Fukushima and H. K. Birnbaum</b>	437
HYDRIDE FORMATION	
The Precipitation of Gamma-Hydride Plates in Zirconium <b>G. C. Weatherly</b>	449

The Effects of Misfit and External Stresses on Terminal Solid Solubility in Hydride-Forming Metals <b>M. P. Puls</b>	461
Hydride Precipitation in Alpha-Beta-Zirconium Alloys <b>V. Perovic, G. C. Weatherly and C. J. Simpson</b>	469
Phase Changes in the Niobium-Hydrogen System — III <b>M. Amano, F. M. Mazzolai and H. K. Birnbaum</b>	481
Twist Effect of V-H, Nb-H and Ta-H Alloys Associated with the Precipitation of Hydrides <b>M. Koiwa and O. Yoshinari</b>	491
Hydride Precipitation in Titanium <b>H. Numakura and M. Koiwa</b>	501
Dynamics of Stress Induced Hydride Formation in Vanadium <b>A. Aning and M. Wuttig</b>	511
The Effect of Stress on Hydride Precipitation <b>T. B. Flanagan, N. B. Mason and H. K. Birnbaum</b>	515
On the Formation of Interstitial-Hydrogen Clusters in Iron <b>J. Au and H. K. Birnbaum</b>	519
Phase Changes in the Niobium-Hydrogen System — II. Low Temperature Hydride Phase Transitions <b>B. J. Makenas and H. K. Birnbaum</b>	523
<b>HYDROGEN IN AMORPHOUS METALS</b>	
Overview 19: Hydrogen in Amorphous Metals — I <b>R. Kirchheim, F. Sommer and G. Schluckebier</b>	539
Overview 19: Solubility, Diffusivity and Trapping of Hydrogen in Dilute Alloys, Deformed and Amorphous Metals — II <b>R. Kirchheim</b>	549
Volume Changes during Dissolution of Hydrogen in Metallic Glasses <b>U. Stolz, U. Nagorny and R. Kirchheim</b>	559
Hydrogen Mobility in the Amorphous Alloy $\text{Fe}_{40}\text{Ni}_{40}\text{P}_{14}\text{B}_6$ as Studied by Induced Magnetic Anisotropy Measurements <b>W. Chambron, F. Lancon and A. Chamberod</b>	565
<b>EFFECT OF HYDROGEN ON PLASTIC DEFORMATION</b>	
The Effect of Hydrogen on the Solid Solution Strengthening and Softening of Nickel <b>J. Eastman, F. Heubaum, T. Matsumoto and H. K. Birnbaum</b>	573
Direct Observations of the Effect of Hydrogen on the Behavior of Dislocations in Iron <b>T. Tabata and H. K. Birnbaum</b>	581
Effect of Hydrogen on the Dislocation Structure of Deformed Nickel <b>I. M. Robertson and H. K. Birnbaum</b>	585

Effect of Hydrogen Charging on Stress-Strain Curves for Iron Whiskers <b>E. Lunarska and Z. Wokulski</b>	591
Effect of Electrolytic Hydrogen Charging on Flow Stress and Slip Line Pattern in Iron Single Crystals <b>E. Lunarska, V. Novak, N. Zarubova and S. Kadeckova</b>	599
Effect of Hydrogen Charging-Discharging on the Stress-Strain Relation- ship for Nickel <b>E. Lunarska and J. Flis</b>	605
The Effects of Hydrogen on the Room Temperature Creep of Spheroid- ized 1040-Steel <b>R. A. Oriani and P. H. Josephic</b>	609
The Effect of Hydrogen on the Initiation of Shear Localization in Plain Carbon Steels <b>J. K. Lin and R. A. Oriani</b>	615
The Effect of Hydrogen on Constrained Yielding and Fracture in a Spheroidized Medium-Carbon Steel <b>T. J. Kosco and A. W. Thompson</b>	623
Hydrogen Induced Slip and Twinning in Iron Alloys <b>C. Hwang and I. M. Bernstein</b>	629
Hydrogen Induced Dislocation Motion <b>J. King and B. Block</b>	635
Direct Observations of Enhanced Dislocation Mobility due to Hydrogen <b>T. Matsumoto, J. Eastman and H. K. Birnbaum</b>	639
<b>HYDROGEN EMBRITTLEMENT</b>	
Overview No. 30: Gaseous Hydrogen Embrittlement in FeSi and Ni-Single Crystals <b>H. Vehoff and W. Rothe</b>	647
Hydrogen Embrittlement and Trapping at Crack Tips in Ni-Single Crystals <b>H. Vehoff and H.-K. Klameth</b>	661
Dynamic Model of Hydrogen Induced Intergranular Cracking <b>J. Kameda and M. L. Jokl</b>	669
An Electron Microscopic Study of Hydrogen Embrittlement in Vanadium — II <b>S. Koike and T. Suzuki</b>	675
Hydrogen-Assisted Fracture in Single-Phase Nickel Alloys <b>A. W. Thompson</b>	689
Effect of Sulphur Segregation and Hydrogen Charging on Intergranular Fracture of Iron <b>K. S. Shin and M. Meshii</b>	693
On the Influence of Internal Hydrogen on Fatigue Thresholds of HSLA Steel <b>K. A. Esaklul and W. W. Gerberich</b>	701

The Effect of Hydrogen-Induced Surface Asperities on Fatigue Crack Closure in Ultra-high Strength Steel <b>K. A. Esaklul, A. G. Wright and W. W. Gerberich</b>	705
Hydrogen Embrittlement of Ni <sub>3</sub> Al+B <b>A. K. Kuruvilla and N. S. Stoloff</b>	711
Hydrogen Embrittlement and Grain Boundary Fracture <b>I. M. Robertson, T. Tabata, W. Wei, F. Heubaum and H. K. Birnbaum</b>	717
Direct Observations of Hydrogen Enhanced Crack Propagation in Iron <b>T. Tabata and H. K. Birnbaum</b>	723
Hydrogen Embrittlement of Titanium Sheet under Multiaxial States of Stress <b>R. J. Bourcier and D. A. Koss</b>	729
A Fractographic Study of Gaseous Hydrogen Embrittlement and Liquid-Metal Embrittlement in a Tempered-Martensitic Steel <b>S. P. Lynch</b>	739
Intergranular Hydrogen Embrittlement of Co <sub>3</sub> Ti <b>T. Takasugi and O. Izumi</b>	751
AUTHOR INDEX	757