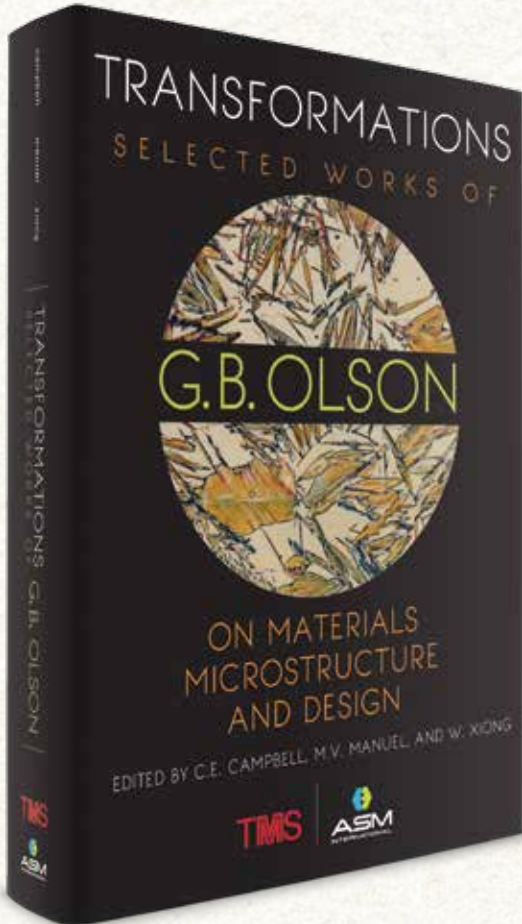




# TRANSFORMATIONS: SELECTED WORKS OF G.B. OLSON ON MATERIALS, MICROSTRUCTURE, AND DESIGN



ASM International and The Minerals, Metals and Materials Society (TMS) have collaborated to present a collection of the selected works of Dr. Greg B. Olson in honor of his 70th birthday in 2017. This collection highlights his influential contributions to the understanding of martensite transformations and the development and application of a systems design approach to materials.

Part I: Martensite, with an Introduction by Sir Harry Bhadeshia, emphasizes Dr. Olson's work to develop a dislocation theory for martensite transformations, to improve the understanding of the statistical nature of martensite nucleation, and to expand use of quantitative microscopy to characterize phase transformations.

Part II: Materials Design, with an Introduction by Dr. Charles Kuehmann, focuses on the application of a systems design approach to materials and the development of integrated computational design curriculum for undergraduate education. Part II includes several examples of the systems design approach to a variety of applications.

The papers chosen for this collection were selected by the editors with input from Dr. Olson.

**Editors:** Carelyn E. Campbell, Michele V. Manuel, and Wei Xiong

**Product Code:** 06838G

**ISBN:** 978-1-62708-137-5

**Estimated Pages:** 500

**Publishers:** ASM International and The Minerals, Metals and Materials Society (TMS)

**Scheduled Release:** November 30, 2017

Non-Member: \$149

ASM Member: \$129



**ORDER YOUR COPY TODAY AT**  
[www.asminternational.org/transformations](http://www.asminternational.org/transformations)

or call the ASM International Service Center at 800.336.5152.

**TMS**



**ASM**  
INTERNATIONAL



# TRANSFORMATIONS: SELECTED WORKS OF G.B. OLSON ON MATERIALS, MICROSTRUCTURE, AND DESIGN

## Contents:

### Editors' Preface

Carelyn E. Campbell, Michele V. Manuel, and Wei Xiong

### Author's Preface

G.B. Olson

### About the Author

### Introduction to Part I: Martensite

Harry Bhadeshia

### Chapter 1

"Dislocation Theory of Martensitic Transformations," G.B. Olson and M. Cohen, in *Dislocations in Solids* Vol. 7, Chapter 37, ed. F.R.N. Nabarro, North-Holland: Amsterdam (1986)

### Chapter 2

"On the Hierarchy of Interfacial Dislocation Structure," R.W. Balluffi and G.B. Olson, *Metall. Trans. A* 16A (1985)

### Chapter 3

"Martensitic Nucleation," G.B. Olson and A.L. Roitburd, *Martensite*, eds. G.B. Olson and W.S. Owen, ASM International (1992)

### Chapter 4

"Statistical Aspects of Martensitic Nucleation," G.B. Olson, K. Tsuzaki, and M. Cohen, *Phase Transitions in Condensed Systems – Experiments and Theory*, Vol. 57, ed. G.S. Cargill, F. Spaepen, and K.N. Tu, MRS (1987)

### Chapter 5

"New Directions in Martensite Theory," G.B. Olson, Proc. ICOMAT 98, *Mater. Sci. Eng.*, A273-275 (1999)

### Chapter 6

"Distributed-Activation Kinetics of Heterogeneous Martensitic Nucleation," M. Lin, G.B. Olson, and M. Cohen, *Metall. Trans.* 23A (1992)

### Chapter 7

"Coupled Diffusional/Displacive Transformations," G.B. Olson, H.K.D.H. Bhadeshia, and M. Cohen, *Acta. Metall.* 37 (1989)

### Chapter 8

"Kinetics of martensite transformations in steels," G.B. Olson and Z.D. Feinberg, *Phase Transformations in Steels*, Volume 2, eds. S. Arnold & E. Pereloma, Woodhead Publishing (2012)

### Chapter 9

"Spinodal Decomposition During Aging of Fe-Ni-C Martensites," K.A. Taylor, L. Chang, G.B. Olson, G.D.W. Smith, M. Cohen, and J.B. Vander Sande, *Metall. Trans.* 20A (1989)

### Introduction to Part II: Materials Design

Charles Kuehmann

### Chapter 10

"Computational Design of Hierarchically Structured Materials," G.B. Olson, *Science*, Vol. 277, No. 5330 (1997)

### Chapter 11

"Science of Steel," G.B. Olson, in *Innovations in Ultrahigh-Strength Steel Technology*, ed. G.B. Olson, M. Azrin, and E.S. Wright, Sagamore Army Materials Research Conference Proceedings: 34th (1990)

### Chapter 12

"Designing a New Material World," G.B. Olson, *Science*, Vol. 288, 12 May 2000

### Chapter 13

"Charge Transfer Mechanism of Hydrogen-Induced Intergranular Embrittlement of Iron," L. Zhong, A.J. Freeman, R. Wu, and G.B. Olson, *Phys.*, Rev. B, No. 21 (2000)

### Chapter 14

"Influence of Alloying Additions on Grain Boundary Cohesion of Transition Metals: First-Principles Determination and Its Phenomenological Extension," W.T. Geng, A.J. Freeman, and G.B. Olson, *Phys.*, Rev. B 63 (2001)

### Chapter 15

"Strong interface adhesion in Fe/TiC," J.-H. Lee, T. Shishidou, Y.-J. Zhao, A.J. Freeman, and G.B. Olson, *Philosophical Magazine*, Vol. 85, No. 31 (2005)

### Chapter 16

"Systems Design of High Performance Stainless Steels: I. Conceptual Design," C.E. Campbell and G.B. Olson, *J. Comput. Aided Mater. Des.*, 7 (2001)

### Chapter 17

"Systems Design of High Performance Stainless Steels: II. Prototype Characterization," C.E. Campbell and G.B. Olson, *J. Comput. Aided Mater. Des.*, 7 (2001)

### Chapter 18

"Computer-Aided Design of Transformation Toughened Blast-Resistant Naval Hull Steels: Part I," A. Saha, G.B. Olson, *J. Comput.-Aided Mater. Des.*, Vol. 14, No. 2 (2007)

### Chapter 19

"Prototype evaluation of transformation toughened blast resistant naval hull steels: Part II," A. Saha, J. Jung, and G.B. Olson, *J. Comput.-Aided Mater. Des.*, Vol. 14, No. 2 (2007)

### Chapter 20

"Design of Heusler Precipitation Strengthened NiTi- and PdTi-Base SMAs for Cyclic Performance," D.J. Frankel and G.B. Olson, *Shape Memory and Superelasticity*, 1 (2015)

### Chapter 21

"ICME: Success Stories and Cultural Barriers," C.J. Kuehmann and G.B. Olson, *Models, Databases, and Simulation Tools Needed for the Realization of Integrated Computational Materials Engineering*, eds. S. Arnold and T. Wong, ASM International (2011)

### Chapter 22

"Computer Simulations for the Prediction of Microstructure/Property Variation in Aeroturbine Disks," H.-J. Jou, P. Voorhees, and G.B. Olson, *Superalloys 2004*, TMS (2004)

### Chapter 23

"Precipitation Model Validation in 3rd Generation Aeroturbine Disc Alloys," G.B. Olson, H.-J. Jou, J. Jung, J.T. Sebastian, A. Misra, I. Locci, and D. Hull, *Superalloys 2008*, TMS (2008)

### Chapter 24

"Multiscale Ductile Fracture Integrating Tomographic Characterization and 3-D Simulation," S. Chan, S. Tang, A. M. Kopacz, D. Rowenhorst, G. Spanos, W.K. Liu, and G.B. Olson, *Acta Mater.*, 82 (2015)

### Chapter 25

"3D Modeling of Subsurface Fatigue Crack Nucleation Potency of Primary Inclusions in Heat Treated and Shot Peened Martensitic Gear Steels," R. Prasannavenkatesan, J. Zhang, D.L. McDowell, G.B. Olson, and H.-J. Jou, *Int. J. Fatigue*, Vol. 31, No. 7 (2009)

### Chapter 26

"Genomic Materials Design: The Ferrous Frontier," G.B. Olson, *Acta Mater.*, Diamond Jubilee Issue, 61 (2013)

### Chapter 27

"Materials Genomics: From CALPHAD to Flight," G.B. Olson and C.J. Kuehmann, *Scripta Mater.*, 70 (2014)

### Chapter 28

"Cybermaterials: Materials by Design and Accelerated Insertion of Materials," W. Xiong and G.B. Olson, *Computational Materials*, 2 (2016)

### Chapter 29

"Hierarchical Model for Coaching Technical Design Teams," M.V. Manuel, A.F. McKenna, and G.B. Olson, *IJEE*, Vol. 24, No. 2 (2008)

### Appendix

Patents and Publications

TMS



ASM  
INTERNATIONAL