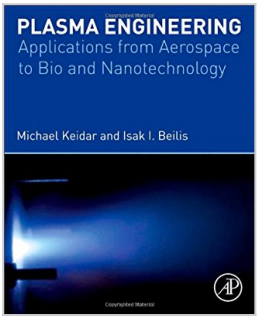

Plasma Engineering: Applications from Aerospace to Bio and Nanotechnology

By Michael Keidar, Isak Beilis

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Plasma Engineering is the first textbook that addresses plasma engineering in the aerospace, nanotechnology, and bioengineering fields from a unified standpoint. It covers the fundamentals of plasma physics at a level suitable for an upper level undergraduate or graduate student, and applies the unique properties of plasmas (ionized gases) to improve processes and performance over a wide variety of areas such as materials processing, spacecraft propulsion, and nanofabrication.

The book starts by reviewing plasma particle collisions, waves, and instabilities, and proceeds to diagnostic tools, such as planar, spherical, and emissive probes, and the electrostatic analyzer, interferometric technique, and plasma spectroscopy. The physics of different types of electrical discharges are considered, including the classical Townsend mechanism of gas electrical breakdown and the Paschen law. Basic approaches and theoretical methodologies for plasma modeling are described, based on the fluid description of plasma solving numerically magnetohydrodynamic (MHD) equations and the kinetic model particle techniques that take into account kinetic interactions among particles and electromagnetic fields. Readers are then introduced to the widest variety of applications in any text on the market, including space propulsion applications and application of low-temperature plasmas in nanoscience and nanotechnology. The latest original results on cold atmospheric plasma (CAP) applications in medicine are presented. The book includes a large number of worked examples, end of chapter exercises, and historical perspectives. There is also an accompanying plasma simulation software covering the Particle in Cell (PIC) approach, available at http://www.particleincell.com/blog/2011/particle-in-cell-example/.

This book is appropriate for grad level courses in Plasma Engineering/Plasma Physics in departments of Aerospace Engineering, Electrical Engineering, and Physics. It will also be useful as an introduction to plasma engineering and its applications for early career researchers and practicing engineers.

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Editorial Review

Review

*"This is a very well written, accessible book on a usually very mathematically intensive subject…The text could be used for a graduate class in physics or material science…Professionals working in related plasma science fields would also find this book useful as an up-to-date source on the latest developments in plasma arc theory and related applications."--**IEEE Electrical Insulation Magazine,*** **May/June 2014**

From the Back Cover

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Plasma Engineering is a textbook which covers the fundamentals of plasma physics at a level suitable for students using application examples. It contains the widest variety of applications of any text on the market, spanning the areas of aerospace engineering, nanotechnology, and nano-bioengineering.

This is a highly practically useful text for courses on Plasma Engineering or Plasma Physics in departments of Aerospace Engineering, Electrical Engineering, and Physics. It is also useful as an introduction to plasma engineering and its applications for early career researchers and practicing engineers.

About the Authors;

Michael Keidar is an Associate Professor in the Department of Mechanical and Aerospace Engineering at The George Washington University. He is Director of George Washington Institute for Nanotechnology. He is a Senior Member of The Institute of Electrical and Electronic Engineers (IEEE), and an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA), member of the American Physical Society (APS) and a founding member of the International Society of Plasma Medicine (ISPM), and a member of AIAA Electric Propulsion Technical Committee (EP). The Micropropulsion and Nanotechnology Laboratory (MpNL), was founded and directed by him. His research interest include plasma propulsion, plasma-based nanotechnology and medicine. He has authored over 130 journal papers, book chapter and 5 patents.

Isak Beilis is a Professor of the Faculty of Engineering at Tel Aviv University. He is a Senior Member of The Institute of Electrical and Electronic Engineers (IEEE), Member of Israel Plasma Sciences and Technology Association, Member of Israel Physical Society. Guest Editor of Special Issue of IEEE TRANSACTIONS ON PLASMA SCIENCE. His research interests include physical phenomena in high current electrical discharges, at the electrode surface and in the near electrode plasma, vacuum arc film deposition, ablation phenomena at solid-plasma interface, laser matter interaction. He has authored 170 journal articles, 12 book chapters, 2 patents and co-author of 2 books.

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Teaching: thermodynamics, heat transfer, propulsion, plasma engineering

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2008 elected Associate Fellow, AIAA

2006 Research Faculty Recognition Award by University of Michigan

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American Institute of Aeronautics and Astronautics (AIAA), Associate Fellow

American Physical Society (APS), Member

International Society of Plasma Medicine (ISPM), Founding Member

Member of AIAA Electric Propulsion Technical Committee (EP)

Founder and Director, Micropropulsion and Nanotechnology Laboratory (MpNL)

Steering Committee, Plasma Nanoscience Symposium (iPlasmaNanoSym)

Steering Committee, GW Institute for Biomedical Engineering (IBE)

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RESEARCH INTERESTS

Physical phenomena in high current electrical discharges, at the electrode surface and in

the near electrode plasma

author of over 150 journal articles, 12 book chapters, and 2 patents

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