

1. Record Nr.	UNINA9910827879403321
Autore	Goebel Dan M. <1954->
Titolo	Fundamentals of electric propulsion : ion and Hall thrusters // Dan M. Goebel, Ira Katz
Pubbl/distr/stampa	Hoboken, N.J., : Wiley, c2008
ISBN	1-282-26782-5 9786612267826 0-470-43644-1 0-470-43626-3
Edizione	[1st ed.]
Descrizione fisica	1 online resource (528 p.)
Collana	JPL space science and technology series ; ; 1
Altri autori (Persone)	KatzIra <1945->
Disciplina	629.47/55
Soggetti	Ion rockets
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Fundamentals of Electric Propulsion: Ion and Hall Thrusters; Contents; Note from the Series Editor; Foreword; Preface; Acknowledgments; Chapter 1: Introduction; 1.1 Electric Propulsion Background; 1.2 Electric Thruster Types; 1.3 Ion Thruster Geometry; 1.4 Hall Thruster Geometry; 1.5 Beam/plume Characteristics; References; Chapter 2: Thruster Principles; 2.1 The Rocket Equation; 2.2 Force Transfer in Ion and Hall Thrusters; 2.3 Thrust; 2.4 Specific Impulse; 2.5 Thruster Efficiency; 2.6 Power Dissipation; 2.7 Neutral Densities and Ingestion in Electric Thrusters; References; Problems Chapter 3: Basic Plasma Physics 3.1 Introduction; 3.2 Maxwell's Equations; 3.3 Single Particle Motions; 3.4 Particle Energies and Velocities; 3.5 Plasma as a Fluid; 3.5.1 Momentum Conservation; 3.5.2 Particle Conservation; 3.5.3 Energy Conservation; 3.6 Diffusion in Partially Ionized Gases; 3.6.1 Collisions; 3.6.2 Diffusion and Mobility Without a Magnetic Field; 3.6.3 Diffusion Across Magnetic Fields; 3.7 Sheaths at the Boundaries of Plasmas; 3.7.1 Debye Sheaths; 3.7.2 Pre-Sheaths; 3.7.3 Child-Langmuir Sheaths; 3.7.4 Generalized Sheath Solution; 3.7.5 Double Sheaths 3.7.6 Summary of Sheath Effects References; Problems; Chapter 4: Ion Thruster Plasma Generators; 4.1 Introduction; 4.2 Idealized Ion Thruster Plasma Generator; 4.3 DC Discharge Ion Thruster; 4.3.1

Generalized 0-D Ring-Cusp Ion Thruster Model; 4.3.2 Magnetic Multipole Boundaries; 4.3.3 Electron Confinement; 4.3.4 Ion Confinement at the Anode Wall; 4.3.5 Ion and Excited Neutral Production; 4.3.6 Neutral and Primary Densities in the Discharge Chamber; 4.3.7 Power and Energy Balance in the Discharge Chamber; 4.3.8 Discharge Loss; 4.3.9 Discharge Stability; 4.3.10 Recycling Behavior
4.3.11 Limitations of a 0-D Model 4.4 Kaufman Ion Thrusters; 4.5 rf Ion Thrusters; 4.6 Microwave Ion Thrusters; 4.7 2-D Computer Models of the Ion Thruster Discharge Chamber; 4.7.1 Neutral Atom Model; 4.7.2 Primary Electron Motion and Ionization Model; 4.7.3 Discharge Chamber Model Results; References; Problems; Chapter 5: Ion Thruster Accelerator Grids; 5.1 Grid Configurations; 5.2 Ion Accelerator Basics; 5.3 Ion Optics; 5.3.1 Ion Trajectories; 5.3.2 Perveance Limits; 5.3.3 Grid Expansion and Alignment; 5.4 Electron Backstreaming; 5.5 High-Voltage Considerations; 5.5.1 Electrode Breakdown
5.5.2 Molybdenum Electrodes 5.5.3 Carbon-Carbon Composite Materials; 5.5.4 Pyrolytic Graphite; 5.5.5 Hold-off and Conditioning in Ion Thrusters; 5.6 Ion Accelerator Grid Life; 5.6.1 Grid Models; 5.6.2 Barrel Erosion; 5.6.3 Pits-and-Grooves Erosion; References; Problems; Chapter 6: Hollow Cathodes; 6.1 Introduction; 6.2 Cathode Configurations; 6.3 Thermionic Electron Emitter Characteristics; 6.4 Insert Region Plasma; 6.5 Orifice Region Plasma; 6.6 Hollow Cathode Thermal Models; 6.7 Cathode Plume-Region Plasma; 6.8 Hollow Cathode Life; 6.8.1 Dispenser Cathodes in Insert Plasmas
6.8.2 Cathode Insert Temperature

Sommario/riassunto

Throughout most of the twentieth century, electric propulsion was considered the technology of the future. Now, the future has arrived. This important new book explains the fundamentals of electric propulsion for spacecraft and describes in detail the physics and characteristics of the two major electric thrusters in use today, ion and Hall thrusters. The authors provide an introduction to plasma physics in order to allow readers to understand the models and derivations used in determining electric thruster performance. They then go on to present detailed explanations of: Thruster
