1. Record Nr. UNINA9910809738703321

Autore	Fonash S. J
Titolo	Solar cell device physics / / Stephen J. Fonash
Pubbl/distr/stampa	Burlington, Mass., : Academic Press/Elsevier, c2010
ISBN	1-282-61809-1 9786612618093 0-08-091227-3
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (382 p.)
Disciplina	621.31/244 621.31244
Soggetti	Solar cells Solid state physics
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	Front Cover; Solar Cell Device Physics; Copyright Page; Contents; Preface; Acknowledgments; List of Symbols; List of Abbreviations; Chapter 1 Introduction; 1.1 Photovoltaic Energy Conversion; 1.2 Solar Cells and Solar Energy Conversion; 1.3 Solar Cell Applications; References; Chapter 2 Material Properties and Device Physics Basic to Photovoltaics; 2.1 Introduction; 2.2 Material Properties; 2.2.1 Structure of solids; 2.2.2 Phonon spectra of solids; 2.2.3 Electron energy levels in solids; 2.2.4 Optical phenomena in solids; 2.2.5 Carrier recombination and trapping; 2.2.6 Photocarrier generation 2.3 Transport2.3.1 Transport processes in bulk solids; 2.3.2 Transport processes at interfaces; 2.3.3 Continuity concept; 2.3.4 Electrostatics; 2.4 The Mathematical System; 2.5 Origins of Photovoltaic Action; References; Chapter 3 Structures, Materials, and Scale; 3.1 Introduction; 3.2 Basic Structures for Photovoltaic Action; 3.2.1 General comments on band diagrams; 3.2.2 Photovoltaic action arising from built-in electrostatic fields; 3.2.3 Photovoltaic action arising from diffusion; 3.2.4 Photovoltaic action arising from effective fields; 3.2.5 Summary of practical structures 3.3 Key Materials3.3.1 Absorber materials; 3.3.2 Contact materials; 3.4 Length Scale Effects for Materials and Structures; 3.4.1 The role of scale

in absorption and collection; 3.4.2 Using the nano-scale to capture lost energy; 3.4.3 The role of scale in light management; References; Chapter 4 Homojunction Solar Cells; 4.1 Introduction; 4.2 Overview of Homojunction Solar Cell Device Physics; 4.2.1 Transport; 4.2.2 The homojunction barrier region; 4.3 Analysis of Homojunction Device Physics: Numerical Approach; 4.3.1 Basic p-n homojunction; 4.3.2 Addition of a front HT-EBL
4.3.3 Addition of a front HT-EBL and back ET-HBL4.3.4 Addition of a front high-low junction; 4.3.5 A p-i-n cell with a front HT-EBL and back ET-HBL; 4.3.6 A p-i-n cell using a poor absorber; 4.4 Analysis of Homojunction Device Physics: Analytical Approach; 4.4.1 Basic p-n homojunction; 4.5 Some Homojunction Configurations; References; Chapter 5 Semiconductor-semiconductor Heterojunction Cells; 5.1 Introduction; 5.2 Overview of Heterojunction Solar Cell Device Physics; 5.2.1 Transport; 5.2.2 The heterojunction barrier region; 5.3 Analysis of Heterojunction Device Physics: Numerical Approach
5.3.1 Absorption by free electron-hole pair excitations5.3.2 Absorption by exciton generation; 5.4 Analysis of Heterojunction Device Physics: Analytical Approach; 5.4.1 Absorption by free electron-hole excitations; 5.4.2 Absorption by excitons; 5.5 Some Heterojunction Configurations; References; Chapter 6 Surface-barrier Solar Cells; 6.1 Introduction; 6.2 Overview of Surface-barrier Solar Cell Device Physics; 6.2.1 Transport; 6.2.2 The surface-barrier region; 6.3 Analysis of Surface-barrier Device Physics: Numerical Approach; 6.4 Analysis of Surface-barrier Device Physics: Analytical Approach
6.5 Some Surface-barrier Configurations

Sommario/riassunto

There has been an enormous infusion of new ideas in the field of solar cells over the last 15 years; discourse on energy transfer has gotten much richer, and nanostructures and nanomaterials have revolutionized the possibilities for new technological developments. However, solar energy cannot become ubiquitous in the world's power markets unless it can become economically competitive with legacy generation methods such as fossil fuels. The new edition of Dr. Stephen Fonash's definitive text points the way toward greater efficiency and cheaper production by adding coverage of cutting-ed