

## Solar Energy

### The physics and engineering of photovoltaic conversion, technologies and systems

By Arno Smets, By Klaus Jäger, By Olindo Isabella, By René van Swaaij, By Miro Zeman

#### Description

This comprehensive textbook takes you through everything you need to know about solar energy from the physics of photovoltaic (PV) cells through to the design of PV systems for real-life applications. Solar Energy is an invaluable reference for researchers, industrial engineers and designers working in solar energy generation. The book is also ideal for university and third-level physics or engineering courses on solar photovoltaics, with exercises to check students' understanding and reinforce learning. It is the perfect companion to the Massive Open Online Course (MOOC) on Solar Energy (DelftX, ET.3034TU) presented by co-author Arno Smets. The course is available in English on the nonprofit open source edX.org platform, and in Arabic on edraak.org. Over 100,000 students have already registered for these MOOCs.

#### Table of Contents

##### I. Introduction

1. Energy
2. Status and prospects of PV technology
3. The working principle of a solar cell

##### II. PV Fundamentals

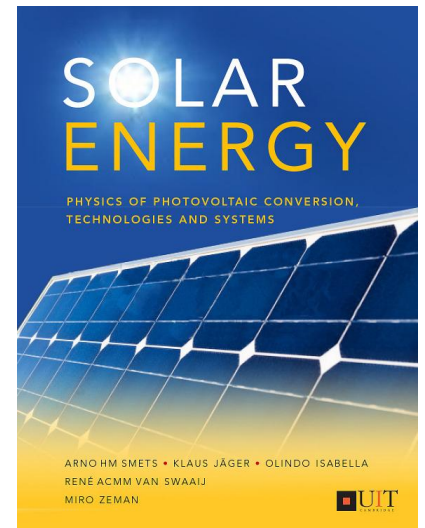
4. Electrodynamics basics
5. Solar radiation
6. Basic semiconductor physics
7. Generation and recombination of electron-hole pairs
8. Semiconductor junctions
9. Solar cell parameters and equivalent circuit
10. Losses and efficiency limits

##### III. PV technology

11. A short history of solar cells
12. Crystalline silicon solar cells
13. Thin-film solar cells
14. A closer look to some processes
15. PV modules
16. Third generation concepts

##### IV. PV systems

17. Introduction to PV systems



**Available:** 01 September 2016

**ISBN:** 9781906860325

**Format:** 9.50in x 7.25in

**Binding:** Paperback

**Extent:** 488

**PRICE:** \$37.00

**BIC Code:** THX; PHFC; TJFD; TH

**BISAC:** TEC031010; SCI077000;  
TEC010000

**Audience:** Professional and scholarly

#### Publisher

UIT Cambridge Ltd.  
**sales-2020@uit.co.uk**  
**www.uit.co.uk**

#### North American Distribution and Wholesalers

Independent Publishers Group  
**www.ipgbook.com**  
Ingram

18. Location issues
19. Components of PV systems
20. PV system design
21. PV System economics and ecology

## **V. Alternative solar energy conversion technologies**

22. Solar thermal energy
23. Solar fuels

## **Appendix**

- A. Derivations in electrodynamics
- B. Derivation of homojunctions  $J$ - $V$  curves
- C. Some aspects of surface recombination
- D. The morphology of selected TCO samples
- E. Some aspects on location issues
- F. Derivations for DC-DC converters
- G. Fluid-dynamic model

## **Bibliography**

## **Index**

---

## **The Author**

Arno Smets teaches and researches at Delft University of Technology. He presents the Massive Open Online Course (MOOC) on Solar Energy (DelftX, ET.3034 TU). Over 100,000 students have registered for the MOOC, which is available in both english and arabic.

The authors' teaching and research activities at Delft University of Technology has resulted in this book. Their vision is to educate the next generation of solar technology innovators.

---