Book | © 2020

Solar Energy

Systems, Challenges, and Opportunities

Editors: Himanshu Tyagi, Prodyut R. Chakraborty, Satvasheel Powar, Avinash Kumar Agarwal

Includes detailed discussions on sustainable and clean energy sources

Provides a wide overview of the relevant and current topics

Adopts an analytical approach to solutions of solar energy technologies

Part of the book series: Energy, Environment, and Sustainability (ENENSU)

Sections

Table of contents (18 chapters)

Solar Cells

About this book

This book covers challenges and opportunities related to solar-energy based systems. It covers a wide variety of topics related to solar energy, including applications-based systems such as solar thermal systems that are focused on drying, desalination, space cooling, refrigeration, and processing; recent advances in solar cells (DSSC) and photovoltaics; technologies for storage of energy (both sensible heating as well as latent heating); and the design of concentrated solar receivers. The information is presented in the context of the overall global energy utilization, and the role of solar energy has been highlighted. The contents of this book will be of interest to researchers, professionals, and policymakers alike.

Keywords

Solar Energy | Sustainable Energy | Energy Storage | Solar Cells | Photovoltaics

Editors and Affiliations

Department of Mechanical Engineering, Indian Institute of Technology Ropar, Rupnagar, India
Himanshu Tyagi

Department of Mechanical Engineering, Indian Institute of Technology Jodhpur, Jodhpur, India
Prodyut R. Chakraborty

School of Engineering, Indian Institute of Technology Mandi, Mandi, India
Satvasheel Powar

Department of Mechanical Engineering, Indian Institute of Technology Kanpur, Kanpur, India
Avinash Kumar Agarwal

About the editors

Dr. Himanshu Tyagi is currently working as an Associate Professor in the School of Mechanical, Materials and Energy Engineering at IIT Ropar. He has previously worked at the Steam Turbine Design Division of Siemens (Germany and India) and at the Thermal and Fluids Core Competency Group of Intel Corp (USA). He received his Ph.D. from Arizona State University, in the field of heat transfer and specifically looked for the radiative and ignition properties of nanofluids. He and his co-workers proposed the concept of direct absorption solar collectors using nanofluids which won the Best Paper Award at the ASME Energy Sustainability Conference at Long Beach, CA. He obtained his master's degree from University of Windsor, Canada, and his bachelor's from IIT Delhi, in Mechanical Engineering. At present, he is working to develop nanotechnology-based clean and sustainable energy sources with a team of several Ph.D., postgraduate, and undergraduate students. Among other awards, he has received Summer Undergraduate Research Award (SURA) from IIT Delhi, International Graduate Student Scholarship from University of Windsor Canada, Indo-US Science and Technology Forum (IUSSTF) grant awarded for organizing an Indo-US Workshop on 'Recent Advances in Micro/Nanoscale Heat Transfer and Applications in Clean Energy Technologies' at IIT Ropar.

Dr. Prodyut Ranjan Chakraborty is an Assistant Professor in the Mechanical Engineering, IIT Jodhpur since February 2013. He received his Bachelor degree of Mechanical Engineering from the North Bengal University in 2000, and his M.Sc Engineering in 2004, and PhD in 2011 both from the Department of Mechanical Engineering, Indian Institute of Science Bangalore. Prior to his joining at IIT Jodhpur, he worked for two years at the Department of Material Physics in Space in German Aerospace Center (DLR) Cologne as a postdoctoral research fellow. He also worked as a Research Analyst at the Applied CFD Lab, G.E. Global Research Centre Bangalore from 2004 to 2005. His primary area of research is numerical modeling of alloy solidification, latent heat based energy storage systems for high temperature applications, Thermal management and thermal comfort, and sorption cooling.

Dr. Satvasheel Powar is an Assistant Professor in the School of Engineering. IIT Mandi since June 2015. He received his Bachelors (Production Engineering) from Shivaji University in 2003, and Masters (Mechanical Engineering) from the Dalarna University, Sweden in 2005. He then worked with Greatcell Solar S.A., Switzerland, and G24i, the UK. He received his Ph.D. in Chemistry/Materials Engineering from the Monash University, Australia in 2013. Before joining at IIT Mandi, he worked for two and half years at the Nanyang Technological University, Singapore as a postdoctoral research fellow. His primary area of research is new generation solar photovoltaic and solar thermal utilization. He was recently awarded the Bhaskara Advanced Solar Energy fellowship by Indo-US Science and Technology Forum (IUSSTF) to visit Lawrence Berkeley National Laboratory, University of California, Berkeley, USA for three months.

Prof. Avinash Kumar Agarwal joined IIT Kanpur in 2001. He worked at the Engine Research Center, University of Wisconsin at Madison, USA as a Post-Doctoral Fellow (1999 – 2001). His interests are IC engines, combustion, alternate and conventional fuels, lubricating oil tribology, optical diagnostics, laser ignition, HCCI, emissions and particulate control, and large bore engines. Prof. Agarwal has published 270+ peer reviewed international journal and conference papers, 35 edited books, and 63 books chapters. He is an associate editor of ASME Journal of Energy Resources Technology, and has edited the Handbook of Combustion, Wiley VCH, Germany. Prof. Agarwal is a Fellow of SAE, ASME, NASI, Royal Society of Chemistry, ISEES, and INAE. He has been the recipient of several prestigious awards such as Clarivate Analystics India Citation Award-2017 in Engineering and Technology, NASI-Reliance Industries Platinum Jubilee Award-2012; INAE Silver Jubilee Young Engineer Award-2012; Dr. C. V. Raman Young Teachers Award: 2011; SAE Ralph R. Teetor Educational Award -2008; INSA Young Scientist Award-2007; UICT Young Scientist Award-2007; INAE Young Engineer Award-2005. Prof. Agarwal received Prestigious Shanti Swarup Bhatnagar Award-2016 in Engineering Sciences.

Bibliographic Information

Book Title
Solar Energy

Book Subtitle
Systems, Challenges, and Opportunities

Editors
Himanshu Tyagi, Prodyut R. Chakraborty, Satvasheel Powar, Avinash Kumar Agarwal

Series Title
Energy, Environment, and Sustainability

DOI
https://doi.org/10.1007/978-981-15-0675-8

Publisher
Springer Singapore

eBook Packages
Chemistry and Materials Science, Chemistry and Material Science (R0)

Copyright Information
Springer Nature Singapore Pte Ltd. 2020

Hardcover ISBN
978-981-15-0674-1
Published: 25 October 2019

Softcover ISBN
978-981-15-0677-2
Published: 25 October 2020

eBook ISBN
978-981-15-0675-8
Published: 14 October 2019

Series ISSN
2522-8366

Series E-ISSN
2522-8374

Edition Number
1

Number of Pages
XV, 423

Topics
Materials for Energy and Catalysis, Renewable Energy, Electrical Power Engineering, Mechanical Power Engineering, Mechanical and Thermal Energy Storage