

Flavio Leandro de Souza  
Edson Roberto Leite *Editors*

# Nanoenergy

Nanotechnology Applied for  
Energy Production

 Springer

Flavio Leandro de Souza  
Edson Roberto Leite  
Editors

# Nanoenergy

Nanotechnology Applied for  
Energy Production

*Editors*

Flavio Leandro de Souza  
Centro de Ciências Naturais e Humanas  
Universidade Federal do ABC  
Santo André  
Brazil

Edson Roberto Leite  
CCET, Depart. de Química  
Universidade Federal de Sao Carlos  
São Carlos, SP  
Brazil

ISBN 978-3-642-31735-4                      ISBN 978-3-642-31736-1 (eBook)  
DOI 10.1007/978-3-642-31736-1  
Springer Heidelberg New York Dordrecht London

Library of Congress Control Number: 2012944973

© Springer-Verlag Berlin Heidelberg 2013

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

# Contents

<b>Incorporation of Inorganic Nanoparticles into Bulk Heterojunction Organic Solar Cells</b> . . . . .	1
Jilian N. de Freitas and Ana Flávia Nogueira	
<b>Nanomaterials for Solar Energy Conversion: Dye-Sensitized Solar Cells Based on Ruthenium (II) <i>Tris</i>-Heteroleptic Compounds or Natural Dyes</b> . . . . .	49
Juliana dos Santos de Souza, Leilane Oliveira Martins de Andrade and André Sarto Polo	
<b>Facile Routes to Produce Hematite Film for Hydrogen Generation from Photoelectro-Chemical Water Splitting</b> . . . . .	81
Flavio L. de Souza, Allan M. Xavier, Waldemir M. de Carvalho, Ricardo H. Gonçalves and Edson R. Leite	
<b>Biofuel Cells: Bioelectrochemistry Applied to the Generation of Green Electricity</b> . . . . .	101
Gabriel M. Olyveira, Rodrigo M. Iost, Roberto A. S. Luz and Frank N. Crespilho	
<b>Recent Advances on Nanostructured Electrocatalysts for Oxygen Electro-Reduction and Ethanol Electro-Oxidation</b> . . . . .	125
Fabio H. B. Lima and Daniel A. Cantane	
<b>Nanocomposites from V<sub>2</sub>O<sub>5</sub> and Lithium Ion Batteries</b> . . . . .	153
Fritz Huguenin, Ana Rita Martins and Roberto Manuel Torresi	
<b>Magnesium Alloys as Anode Materials for Ni-MH Batteries: Challenges and Opportunities for Nanotechnology</b> . . . . .	179
Sydney Ferreira Santos, Flavio Ryoichi Nikkuni and Edson Antonio Ticianelli	