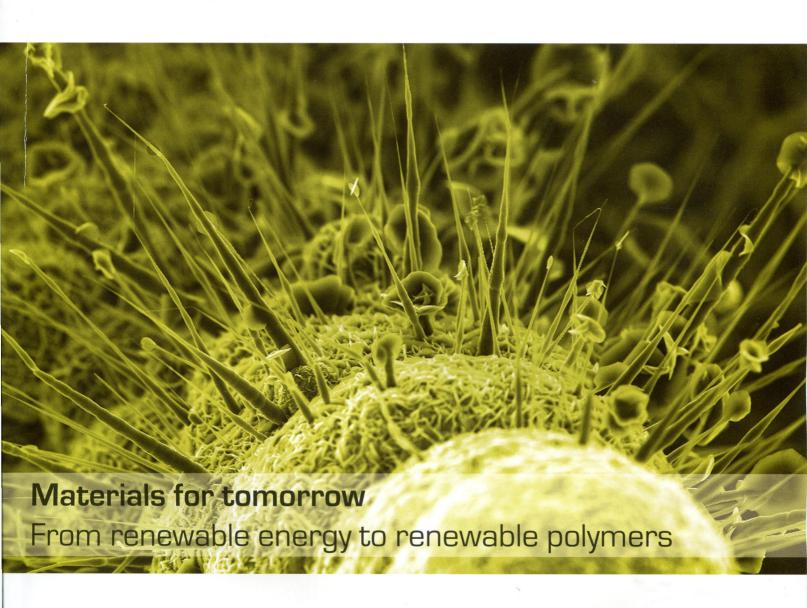




# materialstoday

www.materialstoday.com

SEPTEMBER 2013 | VOLUME 16 | NUMBER 9



Andrey Rogach on quantum dot field effect transistors

Virginia Cádiz discusses renewable polymeric materials

Eric Potma reviews fourwave mixing microscopy



### September 2013 Volume 16 Number 9

pp. 301-354

### materialstoday wanterialsty sin success styll stocket is success.



Andrey Rogach on quantum Veginia Cádiz disc dot field effect transistors renewable polymeric

Eric Potzna reviews I wave mixing micros

Read more about the cover image in this issue's *Uncovered* article. This year's cover competition is brought to you in association with Carl Zeiss. Visit www.zeiss.com/microscopy

# materialstoday

### **REGULARS**

**EDITORIAL** 

301 Fall season

Stewart Bland

COMMENT

302 A drop in the river of time

**Brian Owens** 

**304 NEWS** 

**UNCOVERED** 

351 Incredible carbon

Aleksey A. Zolotukhin and Alexander N. Obraztsov

**354 EVENTS DIARY** 

Федеральное государственное бюджетное учреждение науки Центральная научная библиотека Уральского отделения Российской академии наук (ЦНБ УрО РАН

### MATERIALS TODAY

Published By Elsevier Ltd. The Boulevard, Langford Lane, Kidlington, OX5 1GB, UK

Editorial Editor: Stewart Bland E-mail: s.bland@elsevier.com Editorial Assistant: Zara Preston E-mail: z.preston@elsevier.com Advertising

Advertising Commercial sales commercialsales@elsevier.com Circulation enquiries

Lucy Rodzynska E-mail: lucyrodzynska@elsevier.com Elsevier Ltd.

The Boulevard, Langford Lane,

Kidlington, OX5 1GB, UK

Print subscription orders and payments

Materials Today (ISSN 1369-7021) is published 10 times
per year by Elsevier Ltd. The Boulevard, Langford Lane, Kidlington, OX5 1GB, UK

Europe/ROW Tel: (+44) 1865 843434 USA Tel: (+1) 314 447 8878

Online: www.materialstoday.com/magazine-subscription © 2013 Elsevier Ltd. All rights reserved

This journal and the individual contributions contained in it are protected under copyright by Elsevier Ltd, and the following terms and conditions apply to their use:

User rights
Articles published in this journal are made freely available
on Elsevier's publishing platforms including ScienceDirect.
Articles are protected by copyright and may be used for
non-commercial purposes. Users may access, download, copy,
display, redistribute, adapt, translate, text mine and data mine

the articles provided that:

They cite the article using an appropriate bibliographic citation (i.e. author(s), journal, article title, volume, issue, page numbers, DOI and the link to the definitive published

version on ScienceDirect).

They maintain the integrity of the article.

They retain copyright notices and links to these terms and conditions so it is clear to other users what can and cannot

conditions so it is clear to other users what can and cannot be done with the article.

They ensure that, for any content in the article that is identified as belonging to a third party, any re-use complies with the copyright policies of that third party.

Any translations, for which a prior translation agreement with Elsevier has not been established, must prominently display the statement: "This is an unofficial translation of particle that perspect in an Elsevier rubblistic receiver.

display the statement: This is an unofficial translation of an article that appeared in an Elsevier publication. Elsevier has not endorsed this translation." Use of published articles for commercial purposes is prohibited without permission. For permission to use published articles beyond the uses permitted here, visit www.elsevier.com/permissions. Annual subscription price in the USA US\$325 (valid in North, Control and Subt A Marcia) including air pend elibroty.

Central and South America), including air speed delive Periodical postage paid at Rahway NJ and additional mailing offices.

mailing offices.
Please send payment to: Materials Today
USA Postmaster send all USA address corrections to:
Orders, claims, and journal inquiries: please contact the
Elsevier Customer Service Department nearest you:
St. Louis: Elsevier Customer Service Department, 3251

St. Louis: Elsevier Customer Service Department, 3251
Riverport Lane, Maryland Heights, MO 63043, USA; phone:
(877) 8397126 [toll free within the USA]; (+1) (314) 4478878
[outside the USA]; fax: (+1) (314) 4478077;
e-mail: JournalCustomer Service Department,
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB,
UK; phone: (+44) (1865) 843434; fax: (+44) (1865) 843970;
e-mail: JournalScustomer Service Department, 4F HigashiAzabu, 1-Chome Bldg, 1-9-15 Higashi-Azabu, Minato-ku,
Tokyo 106-0044, Japan; phone: (+81) (3) 5561 5037; fax: (+81)
(3) 5561 5047; e-mail: JournalsCustomerServiceJapan@
elsevier.com

elsevier.com Singapore: Elsevier Customer Service Department 3 Killiney Road, #08-01 Winsland House I, Singapore 239519; phone: (+65) 6349022; fax: (+65) 67331510; e-mail: JournalsCustomerServiceAPAC@elsevier.com Missing issues: Claims for missing issues should be made within six months of the date of dispatch. Responsibility cannot be accepted by the publisher after six months.

No responsibility is assumed by the Publisher for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein. Because of rapid or ideas contained in the material herein. Because of rapid advances in the medical sciences, in particular, independent verification of diagnoses and drug dosages should be made. Although all advertising material is expected to conform to ethical (medical) standards, inclusion in this publication does not constitute a guarantee or endorsement of the quality or value of such product or of the claims made of it by its manufacture

Printed by Henry Ling, The Dorset Press, Dorchester, UK ISSN 1369-7021 Journal Number:03069

### **ScienceDirect**

## materialstoday

### RESEARCH

### **REVIEW**

### Quantum dot field effect transistors

Frederik Hetsch, Ni Zhao, Stephen V. Kershaw and Andrey L. Rogach

### **REVIEW**

### Additives for morphology control in high-efficiency organic solar cells Hsueh-Chung Liao, Chun-Chih Ho, Chun-Yu Chang, Meng-Huan Jao, Seth B. Darling and Wei-Fang Su

### **REVIEW**

### Renewable polymeric materials from vegetable oils: a perspective Gerard Lligadas, Juan C. Ronda, Marina Galià and Virginia Cádiz

### **REVIEW**

### 344 Lighting up micro-structured materials with four-wave mixing microscopy

Jordan Brocious and Eric O. Potma

### **Editorial Advisory Panel**

Caroline Baillie Queen's University, Canada Zhenan Bao

Stanford University, USA Alejandro Lopez Briseno University of Massachsetts, USA Chris Ewels

CNRS, France Alan Heeger University of California, USA Suwan Jayasinghe University College London, UK Mark Johnson Naval Research Laboratory, USA David Kisailus

University of California, USA Frederik Krebs Technical University of Denmark,

Steven Lenhert Florida State University, USA Dan Luo Cornell University, USA Valeria Nicolosi Trinity College, Dublin, Ireland Tae Won Noh

The Korean Physical Society, South Korea Aleksandr Noy University of California, USA Steve Pearton University of Florida, USA

David Seidman Northwestern University, USA Yugang Sun Argonne National Laboratory, USA Helen Van Swygenhoven Paul Scherrer Institute, Switzerland George Whitesides Harvard University, USA Jackie Yi-Ru Ying Institute of Bioengineering and Nanotechnology, Singapore