

# Biomaterials Science

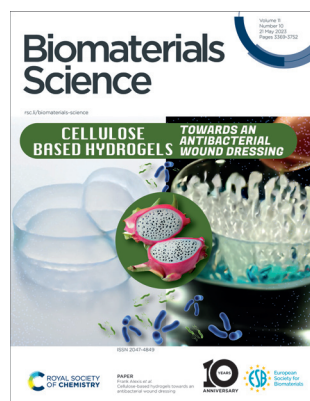
An international high impact journal exploring the underlying science behind the function, interactions and design of biomaterials

[rsc.li/biomaterials-science](http://rsc.li/biomaterials-science)

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

## IN THIS ISSUE

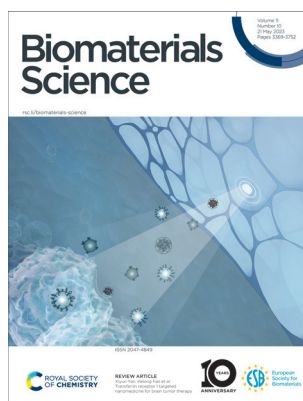
ISSN 2047-4849 CODEN BSICCH 11(10) 3369–3752 (2023)



### Cover

See Frank Alexis *et al.*, pp. 3461–3468.

Image reproduced by permission of Frank Alexis from *Biomater. Sci.*, 2023, **11**, 3461.



### Inside cover

See Xiyun Yan, Kelong Fan *et al.*, pp. 3394–3413.

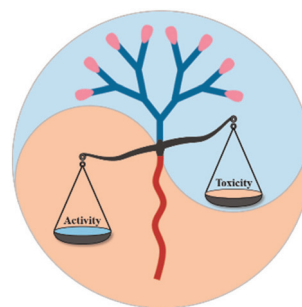
Image reproduced by permission of Kelong Fan from *Biomater. Sci.*, 2023, **11**, 3394.

## MINIREVIEW

3379

### Amphiphilic dendrimers against antibiotic resistance: light at the end of the tunnel?

Christina Galanakou, Dinesh Dhumal\* and Ling Peng\*

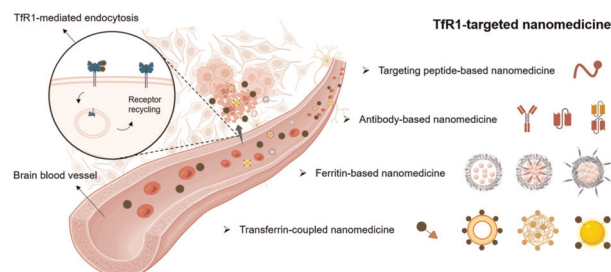


## REVIEWS

3394

### Transferrin receptor 1 targeted nanomedicine for brain tumor therapy

Jianru Li, Zixia Zhang, Baoli Zhang, Xiyun Yan\* and Kelong Fan\*



## Editorial Staff

### Executive Editor

Maria Southall

### Deputy Editor

Laura Ghandhi

### Editorial Production Manager

Cara Sutton

### Assistant Editors

Sean Browner, Molly Colgate, Paul Scott, Alison Winder

### Editorial Assistant

Basita Javeed

### Publishing Assistant

Allison Holloway

### Publisher

Sam Keltie

For queries about submitted papers, please contact

Cara Sutton, Editorial Production Manager in the first instance.

E-mail: [biomaterialsscience@rsc.org](mailto:biomaterialsscience@rsc.org)

For pre-submission queries please contact

Maria Southall, Executive Editor.

E-mail: [biomaterialsscience-rsc@rsc.org](mailto:biomaterialsscience-rsc@rsc.org)

Biomaterials Science (electronic: ISSN 2047-4849) is published 24 times a year by the

Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

Tel +44 (0) 1223 432398; E-mail [orders@rsc.org](mailto:orders@rsc.org)

2023 Annual (electronic) subscription price: £2450, \$4518.

Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version only will be charged VAT.

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at [www.rsc.org/ip](http://www.rsc.org/ip)

Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

### Advertisement sales:

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017;

E-mail [advertising@rsc.org](mailto:advertising@rsc.org)

For marketing opportunities relating to this journal, contact [marketing@rsc.org](mailto:marketing@rsc.org)

# Biomaterials Science

[rsc.li/biomaterials-science](http://rsc.li/biomaterials-science)

An international high impact journal exploring the science of biomaterials and their translation towards clinical use.

## Editorial Board

### Editor-in-chief

Jianjun Cheng, Westlake University, China

### Associate Editors

Khuloud Al-Jamal, King's College London, UK  
Nasim Annabi, University of California, Los Angeles, USA

Lino Ferreira, UC-Biotech, Portugal

Jöns Hilborn, Uppsala University, Sweden

Won Jong Kim, POSTECH, Korea

Shyni Varghese, Duke University, USA

Fu-Jian Xu, Beijing University of Chemical Technology, China

Can Zhang, China Pharmaceutical University,

China

Xinyuan Zhu, Shanghai Jiao Tong University, China

Editorial Board Members

Pamela Habibovic, Maastricht University, Netherlands

## Advisory Board

Lihui Adler-Abramovich, Tel Aviv University, Israel

Kazunari Akiyoshi, iCeMS, Japan

Cameron Alexander, University of Nottingham, UK

Edmondo Benetti, ETH Zürich, Switzerland

Mark Bradley, University of Edinburgh, UK

Jayanta Chatterjee, IISc, India

Arabinda Chaudhuri, CSIR-Indian Institute of Chemical Technology, India

Guoping Chen, National Institute for Materials Science (NIMS), Japan

Yiyun Cheng, East China Normal University, China

Joel Collier, Duke University, USA

Justin Cooper-White, University of Queensland, Australia

Honggang Cui, Johns Hopkins University, USA

Jianwu Dai, Institute of Genetics and Developmental Biology of CAS, China

Cole DeForest, University of Washington, USA

Andrew Dove, University of Birmingham, UK

Yizhou Dong, The Ohio State University, USA

Hongwei Duan, Nanyang Technological University (NTU), Singapore

Christine Dufes, University of Strathclyde, UK

Nicholas Dunne, Dublin City University, Ireland

Jennifer Elisseeff, Johns Hopkins University, USA

Elisabeth Engel Lopez, IBEc, Spain

Shaoqin Sarah Gong, University of Wisconsin-Madison, USA

Dong Keun Han, Cha University, Korea

Ngan Huang, Stanford, USA

Chris Jewell, University of Maryland, USA

Jian Ji, Zhejiang University, China

Ali Khademhosseini, Terasaki Institute for Biomedical Innovation, USA

April Kloxin, University of Delaware, USA

Veena Koul, IIT Delhi, India

Christine Le Maitre, Sheffield Hallam University, UK

Haeshin Lee, KAIST, Republic of Korea

Khoon Lim, University of Sydney, Australia

Matthias Lutolf, Ecole Polytechnique Fédérale de Lausanne, Switzerland

Atsushi Maruyama, Tokyo Institute of Technology, Japan

Phillip Messersmith, University of California, Berkeley, USA

Aline Miller, University of Manchester, UK

Hyejung Mok, Konkuk University, Korea

Steve Oh, A\*STAR, Singapore

Shaunak Pandya, Prolong Pharmaceuticals, USA

Ling Peng, Aix-Marseille University, France

Nicholas Peppas, University of Texas at Austin, USA

Catherine Picart, Grenoble INP, France

Tilo Pompe, University of Leipzig, Germany

Suzie Pun, University of Washington, USA

Shun Shen, Tongji University, China

Heungsoo Shin, Hanyang University, Korea

Molly Shoichet, University of Toronto, Canada

Xintao Shuai, Sun Yat-Sen University, China

Aasheesh Srivastava, IISER, India

Patrick Stayton, University of Washington, USA

Marcus Textor, ETH Zurich, Switzerland

Takafumi Ueno, Tokyo Institute of Technology, Japan

Jun Wang, South China University of Technology, China

Tanja Weil, Max Planck Institute for Polymer Research, Germany

Stephanie Willerth, University of Victoria, Canada

Zimei Wu, University of Auckland, New Zealand

Evelyn Yim, Waterloo, Canada

## Information for Authors

Full details on how to submit material for publication in Biomaterials Science are given in the Instructions for Authors (available from <http://www.rsc.org/authors>). Submissions should be made via the journal's homepage: [rsc.li/biomaterials-science](http://rsc.li/biomaterials-science). Submissions:

The journal welcomes submissions of manuscripts for publication as Full Papers, Communications, Minireviews and Reviews. Full Papers and Communications should describe original work of high quality and impact.

Additional details are available from the Editorial Office or <http://www.rsc.org/authors>

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the

form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023.

Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

Registered charity number: 207890

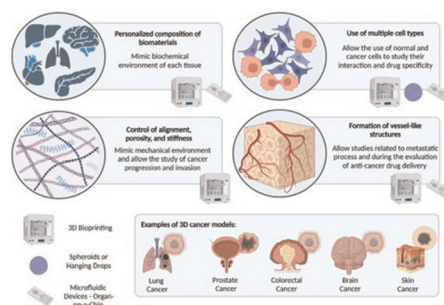


## REVIEWS

3414

**3D bioprinting complex models of cancer**

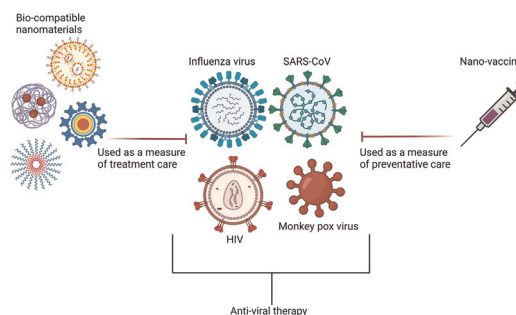
Ruchi Sharma,\* Milena Restan Perez,  
Victor Allisson da Silva, Jess Thomsen,  
Lavanya Bhardwaj, Thiago A. M. Andrade,  
Abdulaziz Alhussan and Stephanie M. Willerth



3431

**Advances in nanomedicine for the treatment of infectious diseases caused by viruses**

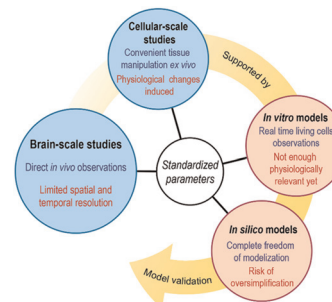
Somya Ranjan Dash and Chanakya Nath Kundu\*



3450

**Solute transport in the brain tissue: what are the key biophysical parameters tying *in vivo* and *in vitro* studies together?**

Daniel Alcaide, Jean Cacheux, Aurélien Bancaud,  
Rieko Muramatsu and Yukiko T. Matsunaga\*

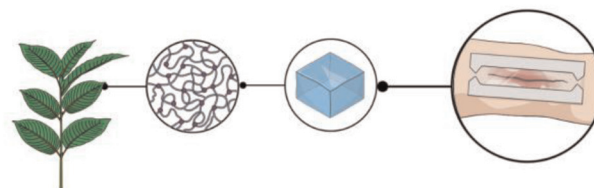


## PAPERS

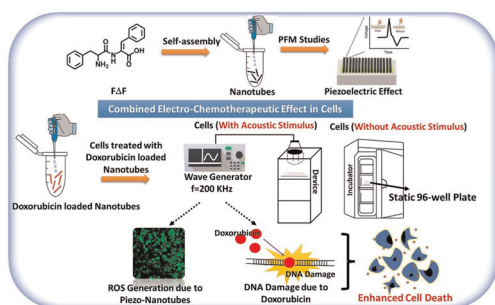
3461

**Cellulose-based hydrogels towards an antibacterial wound dressing**

Esteban Guamba, Nelson Santiago Vispo,  
Daniel C. Whitehead, Ajaya Kumar Singh, Ralph Santos-Oliveira,  
Dario Niebieskikwiat, Camilo Zamora-Ledezma and Frank Alexis\*



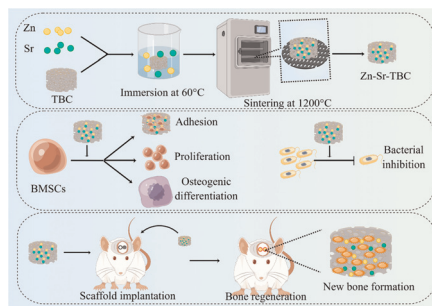
3469



### Bio-piezoelectric phenylalanine- $\alpha\beta$ -dehydrophenylalanine nanotubes as potential modalities for combinatorial electrochemotherapy in glioma cells

Sonika Chibh, Nidhi Aggarwal, Zinnia Mallick, Dipanjan Sengupta, Parrydeep Kaur Sachdeva, Chandan Bera, Nitin Yadav, Virander Singh Chauhan, Dipankar Mandal\* and Jiban Jyoti Panda\*

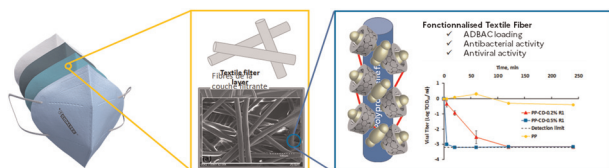
3486



### Zn–Sr-sintered true bone ceramics enhance bone repair and regeneration

Yingkun Hu, Yi Wang, Qinyu Feng, Tianhong Chen, Zhuowen Hao, Shuwei Zhang, Lin Cai, Xiaodong Guo and Jingfeng Li\*

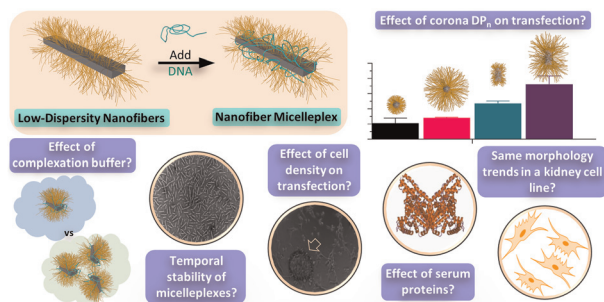
3502



### Antiviral functionalization of a polypropylene nonwoven textile structure as a self-decontaminating layer for respiratory masks

Mickael Maton, Sarah Gabut, Christel Neut, Pascal Odou, Camille Sacareau, Anthony Pinon, Michèle Vialette, Gaétan Gerber, Bernard Martel\* and Nicolas Blanchemain\*

3512



### Optimization of precision nanofiber micelleplexes for DNA delivery

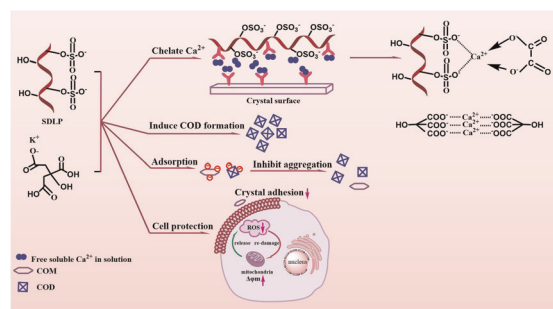
Steven T. G. Street, Hayley C. Parkin, Lennard Shopperly, Josie Chrenek, Keiran Letwin, Stephanie M. Willerth\* and Ian Manners\*



3524

### Synergistic inhibition of calcium oxalate crystal formation and synergistic protection of HK-2 cells from crystal damage by sulfated *Laminarin* polysaccharide and potassium citrate

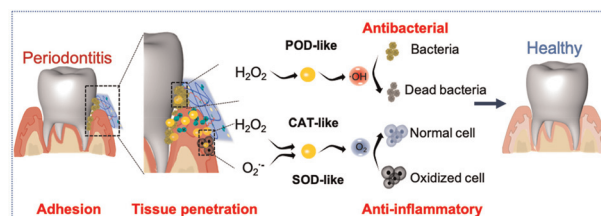
Jing-Hong Liu and Jian-Ming Ouyang\*



3547

### An ionic gel incorporating copper nanodots with antibacterial and antioxidant dual functions for deep tissue penetration treatment of periodontitis in rats

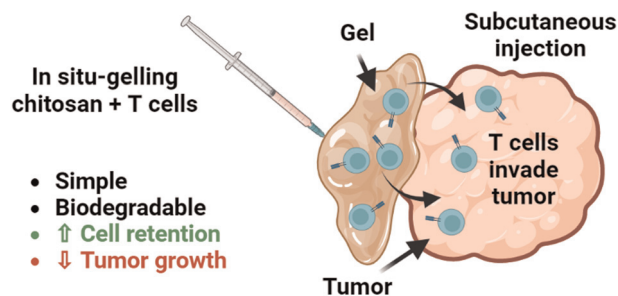
Yiru Gao, Wenxin Zhang, Rong Xue, Yang Shu\* and Jianhua Wang\*



3561

### T cell-loaded injectable chitosan scaffold shows short-term efficacy in localised cancer immunotherapy in mice

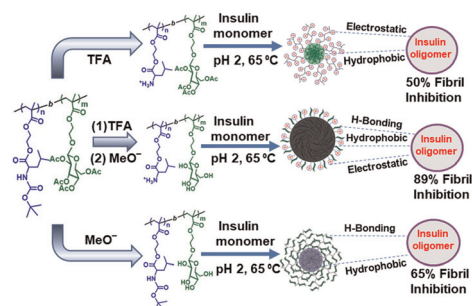
Nicholas Cunningham, Tommy Malaret, Paméla Thébault, Guillaume St-Jean, Feryel Azzi, Dominique Trudel, Réjean Lapointe and Sophie Lerouge\*



3574

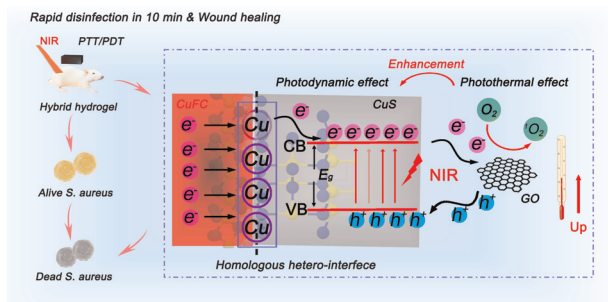
### Insulin fibril inhibition using glycopolymeric nanoassemblies

Avesek Bera, Pooja Ghosh, Soumen Barman, Sagnik Bhattacharya, Babu Sudhamalla, Kalyan Goswami and Priyadarsi De\*





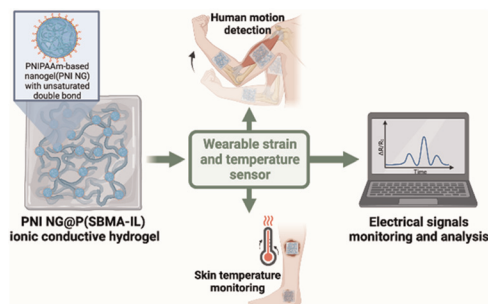
3589



### S–Cu–FC/CuS modified GO carboxymethyl cellulose hydrogel for enhanced photocatalytic sterilization through homo-heterojunction interface accelerated charge transfer

Bo Huang, Wei Guan, Chaofeng Wang, Shuilin Wu,\* Zhenduo Cui, Yufeng Zheng, Zhaoyang Li, Shengli Zhu, Hui Jiang, Paul K. Chu and Xiangmei Liu\*

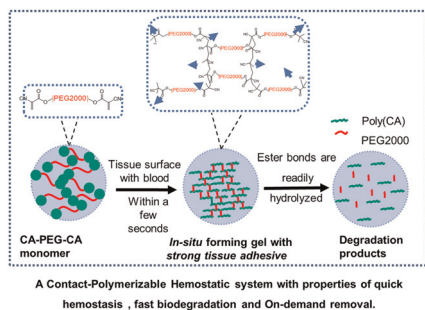
3603



### Nanostructured ionic hydrogel with integrated conductivity, stretchability and thermal responsiveness for a high-performance strain and temperature sensor

Qian Pang,\* Kaihao Wu, Zilian Jiang, Fang Yang, Zewen Shi, Hanlin Gao, Cuicui Zhang, Ruixia Hou\* and Yabin Zhu\*

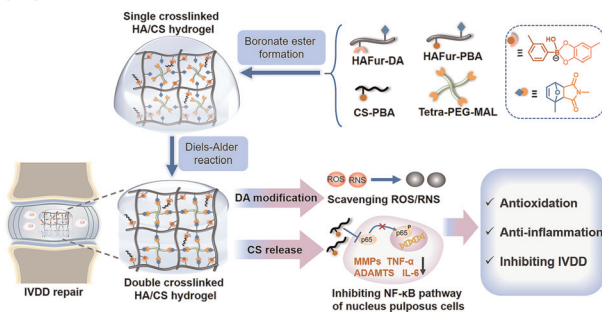
3616



### A contact-polymerizable hemostatic powder for rapid hemostasis

Jia Wang, Cheng Li, Wei Zhang, Weimin Huang, Zhiqiang Liu, Rui Shi, Shiyuan Wang, Shan Liu, Weiguo Shi, Yunlan Li\* and Liang Xu\*

3629



### Injectable chondroitin sulfate-grafted self-antioxidant hydrogels ameliorate nucleus pulposus degeneration against overactive inflammation

Huitong Luo, Zetao Wang, Zhichao He, Zemin Ling, Hao Wang, Jiayi Zhu, Jingjun Nie, Dafu Chen, Qi Feng\* and Xiaodong Cao\*

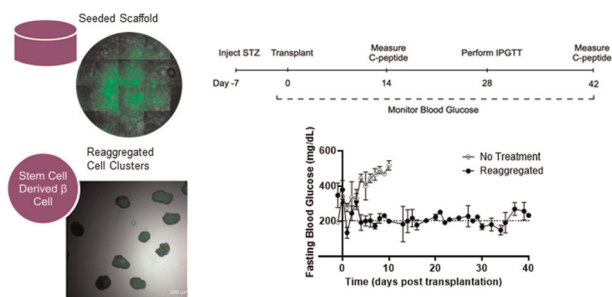


## PAPERS

3645

### Extrahepatic transplantation of 3D cultured stem cell-derived islet organoids on microporous scaffolds

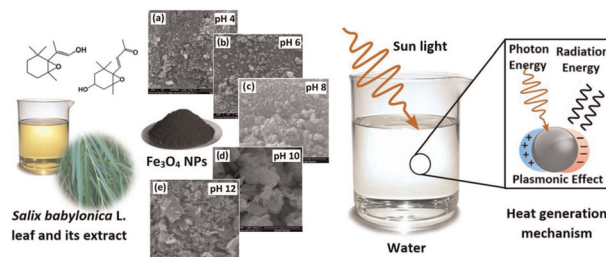
Elizabeth Bealer, Kelly Crumley, Daniel Clough, Jessica King, Maya Behrend, Connor Annulis, Feiran Li, Scott Soleimanpour and Lonnie D. Shea\*



3656

### Sunlight harvesting for heat generation inside water using biosynthesized magnetite nanoparticles

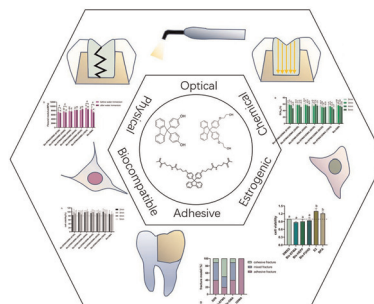
Azeez Abdullah Barzinjy,\* Samir Mustafa Hamad, Vinos Mushir Faris, Ahmed Fattah Abdulrahman, Mohammad Mansoob Khan\* and Amir Abdulrahman Ahmad



3669

### Low shrinkage bulk-filled dental resin composites with non-estrogenic dimethacrylate

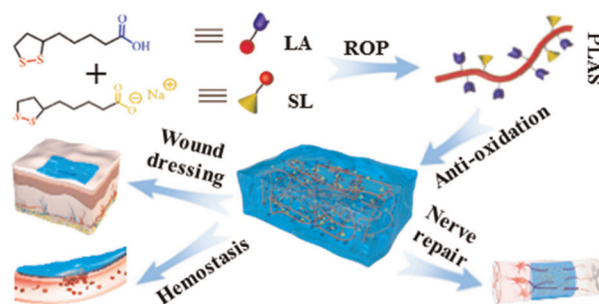
Xinyue Ma, Xiaoqing Zhang, Xiangya Huang, Fang Liu, Jingwei He\* and Sui Mai\*



3683

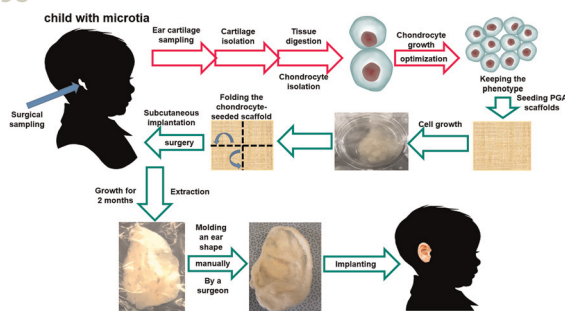
### Green polymer hydrogels from a natural monomer with inherent antioxidative capability for efficient wound healing and spinal cord injury treatment

Jiaqiang Du, Fang Wang, Jiayi Li, Yuxuan Yang, Dong Guo, Yanfeng Zhang, Aimin Yang, Xijing He\* and Yilong Cheng\*



## PAPERS

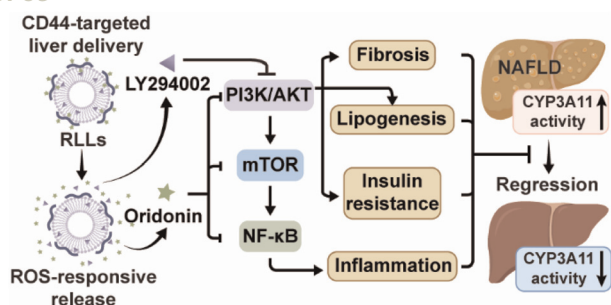
3695



### Optimization of 3D autologous chondrocyte-seeded polyglycolic acid scaffolds to mimic human ear cartilage

Pedro Melgar-Lesmes,\* Oriol Bosch, Rebecca Zubajlo, Gemma Molins, Sofia Comfort, Ainara Luque-Saavedra, Mario López-Moya, Fernando García-Polite, Francisco José Parri Ferrandis, Carolyn Rogers, Agata Gelabertó, Jordi Martorell, Elazer R. Edelman and Mercedes Balcells

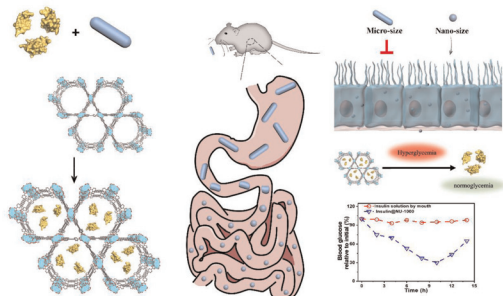
3709



### ROS-scavenging nanomedicine for “multiple crosstalk” modulation in non-alcoholic fatty liver disease

Xiaofei Xin, Jingjing Li, Wantao Wu, Pengbo Zhao, Yang Yang, Ying Zhu, Lianjie Ren, Chao Qin\* and Lifang Yin\*

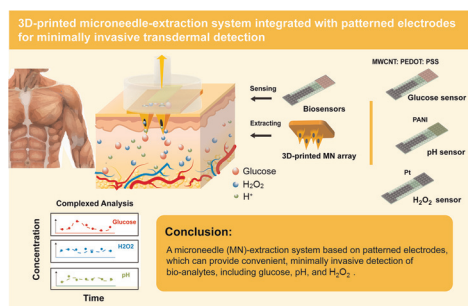
3726



### Transformation of the shape and shrinking the size of acid-resistant metal-organic frameworks (MOFs) for use as the vehicle of oral proteins

Li Yang, Jun Guo, Liwen Wang, Sicheng Tang, Ai-fang Wang, Shengwu Zheng, Zhiyong Guo\* and Xingjie Zan\*

3737



### A 3D-printed microneedle extraction system integrated with patterned electrodes for minimally invasive transdermal detection

Changyuan Zhan, Fanmao Liu, Zhiran Shen, Xinhua Huang, Shuang Huang, Xiangling Li, Jing Liu, Jiang Yang, Jiefeng Xu, Xi Xie\* and Hui-Juan Chen\*

