## **Biomaterials Science**

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

## 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(13) 4401-4742 (2023)



#### Cover

See Chia-Yu Wu, Win-Ping Deng *et al.*, pp. 4522–4536.

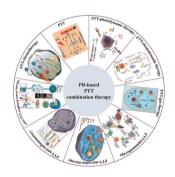
Image reproduced by permission of Win-Ping Deng from *Biomater. Sci.*, 2023, **11**, 4522.

## **REVIEWS**

#### 4411

# Recent advances in Prussian blue-based photothermal therapy in cancer treatment

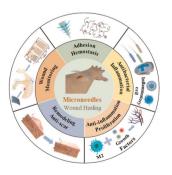
Kaiyuan Tang, Xiao Li, Yanling Hu,\* Xiaonan Zhang, Nan Lu, Qiang Fang, Jinjun Shao, Shengke Li, Weijun Xiu, Yanni Song, Dongliang Yang\* and Junjie Zhang\*



## 4430

# Microneedles: a novel strategy for wound management

Ze Qiang Zhao, Ling Liang, Li Yue Jing, Yue Liu, Yu Han Zhang, Mohammad-Ali Shahbazi,\* Bo Zhi Chen\* and Xin Dong Guo\*



#### **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** 

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

For pre-submission queries please contact Maria Southall, Executive Editor. E-mail: biomaterialsscience-rsc@rsc.org

Biomaterials Science (electronic: ISSN 2047-4849) is published 24

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 OWF, UK

Tel +44 (0)1223 432398; E-mail 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

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

#### Advertisement sales:

Telephone: +44 (0) 207 4378 6556.

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017; E-mail advertising@rsc.org

Burlington House, Piccadilly, London W1J 0BA, UK,

For marketing opportunities relating to this journal. contact marketing@rsc.org

## **Biomaterials Science**

#### rsc.li/biomaterials-science

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

#### **Editorial Board**

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 Univeristy of Chemical

Technology, China Can Zhang, China Pharmaceutical University,

Chuan Zhang, Shanghai Jiao Tong University

Editorial Board Members

Pamela Habibovic, Maastricht University,

Netherlands

Xinyuan Zhu, Shanghai Jiao Tong University, China

#### **Advisory Board**

Lihi 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,

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 Shaogin 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,

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.

. Jun Wang, South China University of Technology,

Tanja Weil, Max Planck Institute for Polyme 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 form: (Original Citation)-Reproduced by permission of the Royal Society 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. 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

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**

#### 4452

Recent progress in metal-organic frameworkbased sonosensitizers for sonodynamic tumor therapy

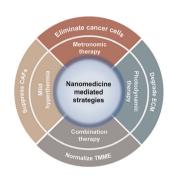
Qin Jiang, Xinran Gao, Wen Zhang and Zhigang Chen\*



#### 4471

## Modulating tumor mechanics with nanomedicine for cancer therapy

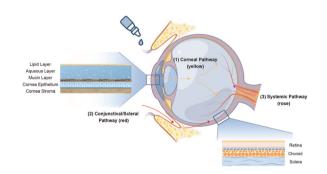
Qingfu Zhao, Jitang Chen, Zhijie Zhang, Chen Xiao, Haowen Zeng, Chen Xu, Xiangliang Yang and Zifu Li\*



#### 4490

Nano-based ocular drug delivery systems: an insight into the preclinical/clinical studies and their potential in the treatment of posterior ocular diseases

Yun Su, Xianqun Fan\* and Yan Pang\*

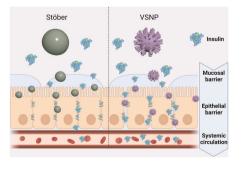


## COMMUNICATION

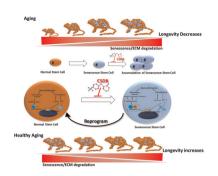
#### 4508

## Virus-like silica nanoparticles enhance macromolecule permeation in vivo

Yuxue Cao, Taskeen Iqbal Janjua, Zhi Qu, Bastian Draphoen, Yunfan Bai, Mika Linden, Md Moniruzzaman, Sumaira Z. Hasnain,\* Tushar Kumeria\* and Amirali Popat\*



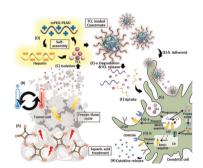
4522



## Anti-aging biomaterial sturgeon chondroitin sulfate upregulating anti-oxidant and SIRT-1/c-fos gene expression to reprogram stem cell senescence and prolong longevity

Abhinay Kumar Singh, Bou-Yue Peng, Shaw-Ting Chien, Chun-Hao Chan, Yue-Hua Deng, Hsiao-Yu Pai, Hong-Jian Wei, Ming-Fu Wang, Shwu-Huey Wang, Chia-Yu Wu\* and Win-Ping Deng\*

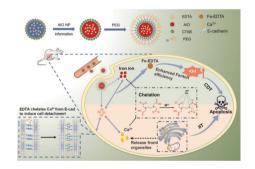
4537



## Ex vivo activation of dendritic cells via coacervatemediated exogenous tumor cell lysate delivery

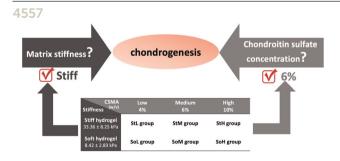
Jihyun Seong, Sehwan Jeong, Sungjun Kim, Seojeong Yun, Yujin Baek and Kyobum Kim\*

4549



## Iron oxide-EDTA nanoparticles for chelationenhanced chemodynamic therapy and ion interference therapy

Changxiao Chen, Qi Meng, Zhendong Liu, Sainan Liu, Weifang Tong, Baichao An, Binbin Ding,\* Ping'an Ma\* and Jun Lin\*



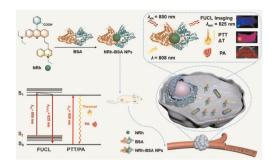
## The effect of chondroitin sulfate concentration and matrix stiffness on chondrogenic differentiation of mesenchymal stem cells

Chengchong Ai, Ling Liu, Kallista Wong, Xuan Hao Tan and James C. H. Goh\*

#### 4574

Albumin-based near-infrared phototheranostics for frequency upconversion luminescence/ photoacoustic dual-modal imaging-guided photothermal therapy

Hui Yu, Aliya Tiemuer, Yanyan Zhu, Ye Sun, Yuanyuan Zhang, Li Liu\* and Yi Liu\*



## 4583

Fabrication of polyvinyl pyrrolidone-K90/Eudragit RL100-based dissolving microneedle patches loaded with alpha-arbutin and resveratrol for skin depigmentation

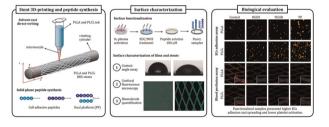
Nway Nway Aung, Supusson Pengnam, Tanasait Ngawhirunpat, Theerasak Rojanarata, Prasopchai Patrojanasophon, Praneet Opanasopit and Boonnada Pamornpathomkul\*



#### 4602

Functionalization of 3D printed polymeric bioresorbable stents with a dual cell-adhesive peptidic platform combining RGDS and YIGSR sequences

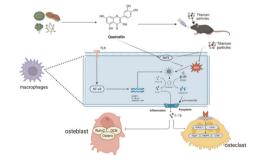
Victor Chausse, Carlos Mas-Moruno, Helena Martin-Gómez, Marc Pino, Maribel Díaz-Ricart, Ginés Escolar, Maria-Pau Ginebra and Marta Pegueroles\*



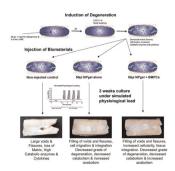
#### 4616

# Quercetin alleviates nanoparticle-induced osteolysis *via* deactivating pyroptosis

Yu Cheng, Zhijian Zhao, Sheng Zhang, Yanglin Wu, Zhou Han, Lijun Li, Yun Teng, Jun Lin,\* Naicheng Liu,\* Shuangjian He\* and Huilin Yang\*

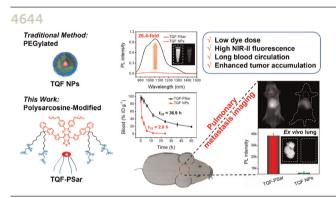


#### 4630



## Injectable biomaterial induces regeneration of the intervertebral disc in a caprine loaded disc culture model

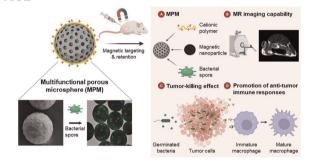
Joseph W. Snuggs, Kaj S. Emanuel, Christine Rustenburg, Ronak Janani, Simon Partridge, Christopher Sammon, Theo H. Smit and Christine L. Le Maitre\*



## Stealth-like polysarcosine-modified nanoparticles with low dye doses and long blood circulation for efficient breast cancer pulmonary metastasis imaging

Shangyu Chen, Peng Zhou, Wan Yang, Danni Hu, Pengfei Chen, Pengfei Sun,\* Jun Ling\* and Quli Fan\*

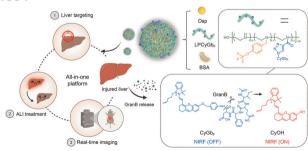
#### 4652



## Multifunctional porous microspheres encapsulating oncolytic bacterial spores and their potential for cancer immunotherapy

Ga-Hyun Bae, Young-Hyun Ryu, Jieun Han, Song Hee Kim, Chun Gwon Park, Jung-Hoon Park, Dong-Hyun Kim, Hong Jae Chon, Chan Kim, Sung-Wook Choi\* and Wooram Park\*

### 4664



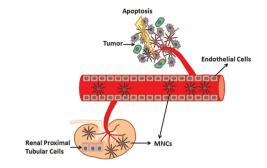
## A facile theragnostic nano-platform for the effective treatment and real-time imaging of acute liver injury

Huixin Li, Kai Hao, Jiayan Wu, Chaoliang He, Shasha He,\* Huayu Tian\* and Xuesi Chen

#### 4675

Toxicity and efficacy of green tea catechin derivative-based micellar nanocomplexes for anticancer protein delivery

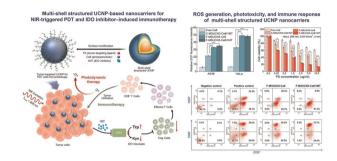
Sijing Xiong, Susi Tan, Peng Huang, Yao Li, Joo Eun Chung, Motoichi Kurisawa, Daniele Zink\* and Jackie Y. Ying\*



## 4684

Multi-shell structured upconversion nanocarriers that combine IDO inhibitor-induced immunotherapy with NIR-triggered photodynamic therapy for deep tumors

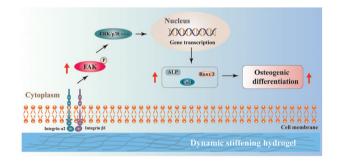
Jongseon Choi and So Yeon Kim\*



#### 4700

Dynamic-stiffening collagen-coated substrate enhances osteogenic differentiation of mesenchymal stem cells through integrin  $\alpha 2\beta 1$ 

Zhenyin Chen, Yang Zou\* and Yonggang Lv\*



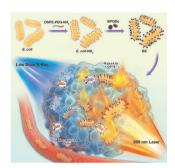
## 4713

Injectable leonurine nanocrystal-loaded microspheres for long-term hyperlipidemia management

Zhiling Song, Shiyu Meng, Zhuang Tang, Xiaoxue Yang, Yuan He, Ying Zheng, Hui Guo, Meirong Du, Yizhun Zhu\* and Xiaolin Wang\*



4727



Bacteria-targeted delivery of black phosphorus quantum dots facilitates photothermal therapy against hypoxic tumors and complementary low-dose radiotherapy

Pengchao Ji, Jinghua Chen, Hao Wang, Linfei Shi,\* Xudong Tang\* and Yanhong Duo