

Biomaterials Science

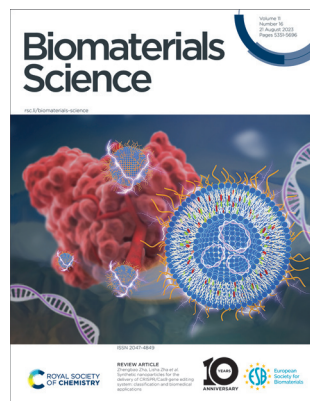
An international high impact journal exploring the underlying science behind the function, interactions and design of biomaterials

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(16) 5351–5696 (2023)



Cover

See Zhengbao Zha, Lisha Zha et al., pp. 5361–5389.

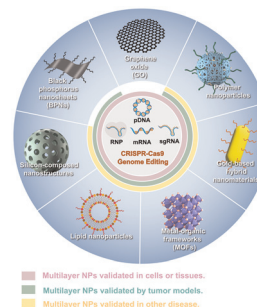
Image reproduced by permission of Zhengbao Zha from *Biomater. Sci.*, 2023, **11**, 5361.

REVIEWS

5361

Synthetic nanoparticles for the delivery of CRISPR/Cas9 gene editing system: classification and biomedical applications

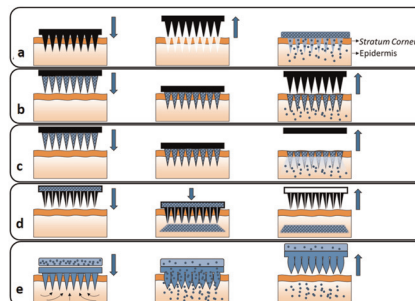
Qi Zheng, Weitao Wang, Yuhang Zhou, Jiayin Mo, Xinyue Chang, Zhengbao Zha* and Lisha Zha*



5390

Recent progress in PLGA-based microneedle-mediated transdermal drug and vaccine delivery

Atefeh Malek-Khatibi, Malihe Sadat Razavi, Alyeh Abdollahi, Milad Rahimzadeghan, Fatemeh Moammeri, Mojgan Sheikhi, Mohamadreza Tavakoli, Mazda Rad-Malekshahi* and Zahra Faraji Rad*



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

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 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

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:
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

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

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

Chuan Zhang, Shanghai Jiao Tong University

Editorial Board Members

Pamela Habibovic, Maastricht University, Netherlands

Xinyuan Zhu, Shanghai Jiao Tong University, China

Advisory Board

Lihl 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, IBE, 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. 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

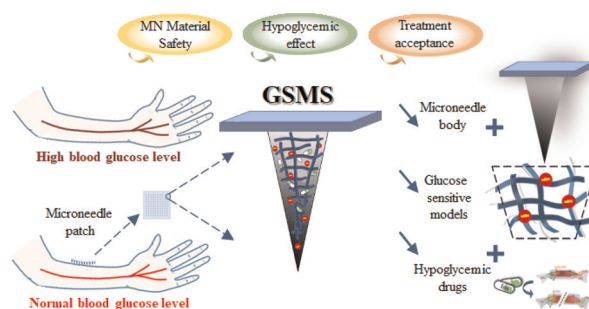


REVIEWS

5410

Progress in the preparation and evaluation of glucose-sensitive microneedle systems and their blood glucose regulation

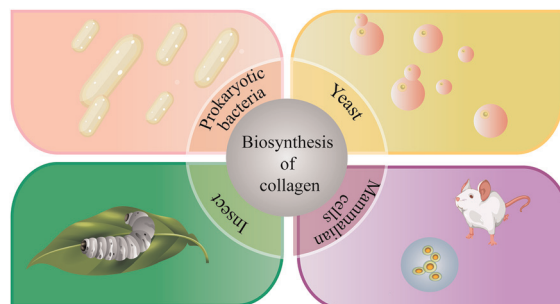
Yu Wang, Haojie Yu,* Li Wang, Jian Hu and Jingyi Feng



5439

Green biomanufacturing in recombinant collagen biosynthesis: trends and selection in various expression systems

Zilong Zhao, Jianjun Deng and Daidi Fan*

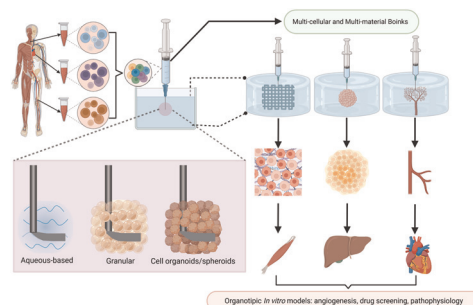


MINIREVIEW

5462

A dive into the bath: embedded 3D bioprinting of freeform *in vitro* models

M. Özgen Öztürk-Öncel, Baltazar Hiram Leal-Martínez, Rosa F. Monteiro, Manuela E. Gomes* and Rui M. A. Domingues*

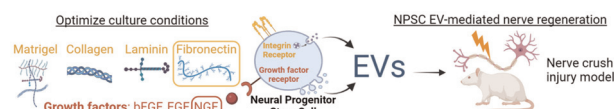


PAPERS

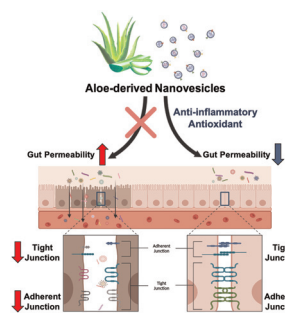
5474

Differentiation state and culture conditions impact neural stem/progenitor cell-derived extracellular vesicle bioactivity

Dipankar Dutta, Nicholas H. Pirolli, Daniel Levy, Jeffrey Tsao, Nicholas Seecharan, Zihui Wang, Xiang Xu, Xiaofeng Jia* and Steven M. Jay*



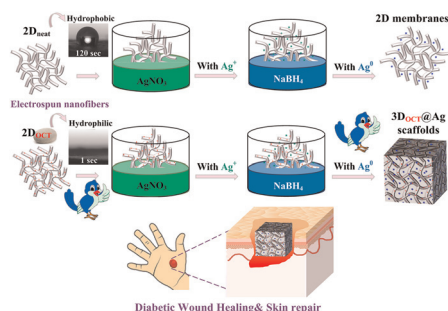
5490



Aloe-derived nanovesicles attenuate inflammation and enhance tight junction proteins for acute colitis treatment

Sang-Hun Choi, Jung-Young Eom, Hyun-Jin Kim, Wonhyo Seo, Hyo-Jung Kwun, Do-Kyun Kim, Jihoon Kim* and Young-Eun Cho*

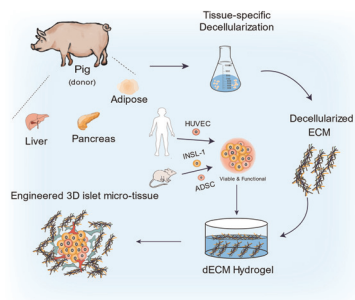
5502



A facile one-stone-two-birds strategy for fabricating multifunctional 3D nanofibrous scaffolds

Altangerel Amarjargal,* Zahra Moazzami Goudarzi, Olga Cegielska, Arkadiusz Gradys, Dorota Kolbuk, Bartłomiej Kalaska, Anna Ruszczyńska and Paweł Sajkiewicz*

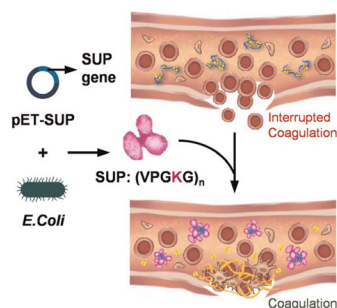
5517



Construction of engineered 3D islet micro-tissue using porcine decellularized ECM for the treatment of diabetes

Xiaocheng Wang, Lijuan Jin, Wenyu Liu, Lukas Stingelin, Pan Zhang* and Zhikai Tan*

5533



Recombinant supercharged polypeptides for safe and efficient heparin neutralization

Jianfei Tu, Qing Liu,* Shengye You, Zhuojun Meng, Shiji Fang, Binhong Yu, Xumin Chen, Yu Zhou, Lulu Zeng, Andreas Herrmann, Gang Chen, Jianliang Shen, Lifei Zheng* and Jiansong Ji*

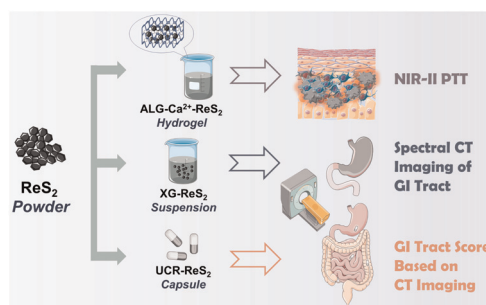


PAPERS

5540

Flexible use of commercial rhenium disulfide for various theranostic applications

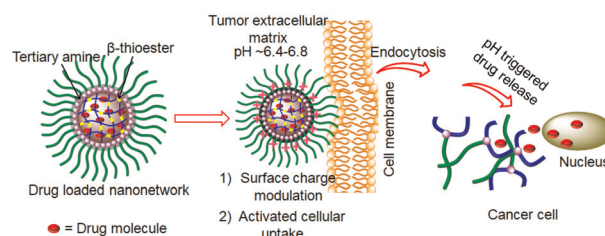
Xiaoyi Wang, Min Ma, Liang Zhang, Xiaoran Wang, Yimou Zhang, Yang Zhao, Huilan Shi, Xuening Zhang,* Fangshi Zhao* and Jinbin Pan*



5549

Tumor acidity-induced surface charge modulation in covalent nanonetworks for activated cellular uptake: targeted delivery of anticancer drugs and selective cancer cell death

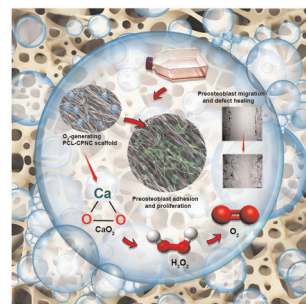
Subrata Santra, Shreya Das, Arunima Sengupta and Mijanur Rahaman Molla*



5560

Scaffolds with high oxygen content support osteogenic cell survival under hypoxia

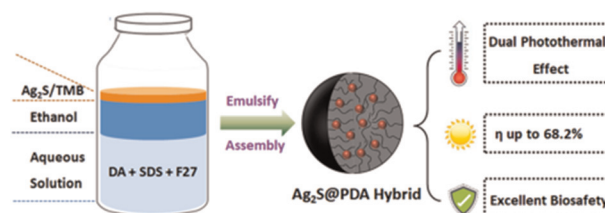
Robin Augustine and Gulden Camci-Unal*



5576

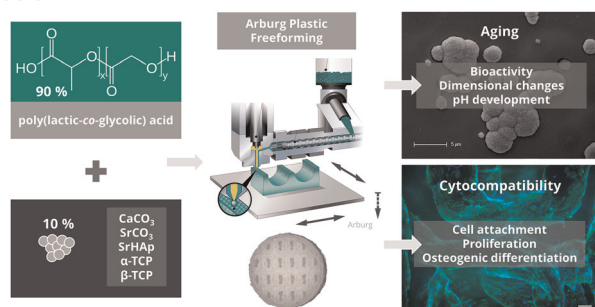
Aqueous green synthesis of organic/inorganic nanohybrids with an unprecedented synergistic mechanism for enhanced near-infrared photothermal performance

Xiaobo Nie, Xu Yang, Dongdong Peng, Jun Wang, Suisui He, Cui-Yun Yu* and Hua Wei*



PAPERS

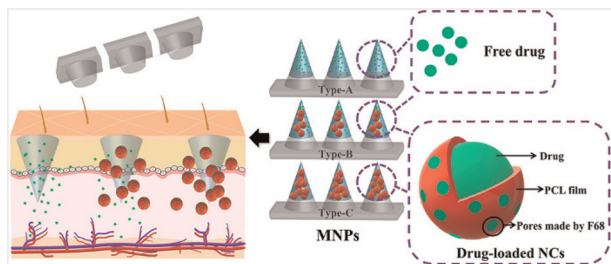
5590



A comparative analysis of 3D printed scaffolds consisting of poly(lactic-co-glycolic) acid and different bioactive mineral fillers: aspects of degradation and cytocompatibility

Tilman Ahlfeld, Anja Lode, Anna-Maria Placht, Tatjana Fecht, Tobias Wolfram, Stefanie Grom, Andreas Hoess, Corina Vater, Christian Bräuer, Sascha Heinemann, Günter Lauer, Frank Reinauer and Michael Gelinsky*

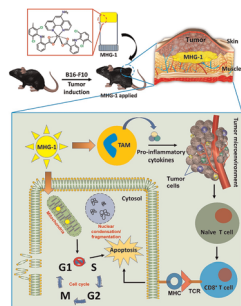
5605



Personalized demand-responsive biphasic microneedle patch for smart drug administration

Shuyue Deng, Yao Shuai, Shibo Zhang, Caixia Sun, Lei Chang, Jie Xu, Ling Tong, Qunsheng Ji, Min Li, Jianjun Dai* and Yanmin Ju*

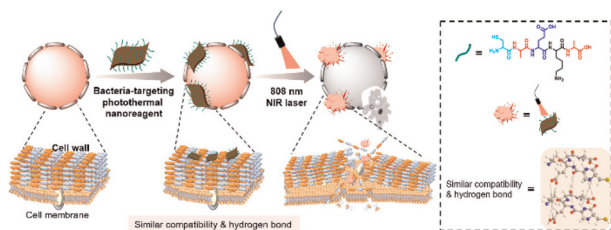
5618



An injectable supramolecular hydrogel as a self-drug-delivery system for local chemoimmunotherapy against melanoma

Sourabh Bera, Hemanta Kumar Datta and Parthasarathi Dastidar*

5634



Bacteria-targeted photothermal therapy for combating drug-resistant bacterial infections

Hongxin Wei, Liu Yang, Chuming Pang, Liqin Lian and Liangzhi Hong*

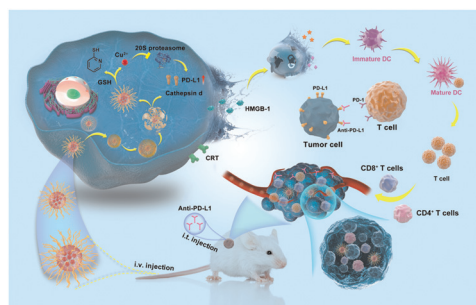


PAPERS

5641

Polymer/copper nanocomplex-induced lysosomal cell death promotes tumor lymphocyte infiltration and synergizes anti-PD-L1 immunotherapy for triple-negative breast cancer

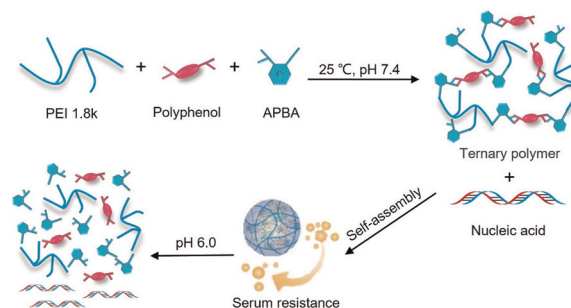
Xiangxiang Hu, Mingming Wang, Shanshan Shi, Manikanda Keerthi Raja, Gourab Gupta, Hexin Chen and Peisheng Xu*



5653

One-pot synthesis of dynamically cross-linked polymers for serum-resistant nucleic acid delivery

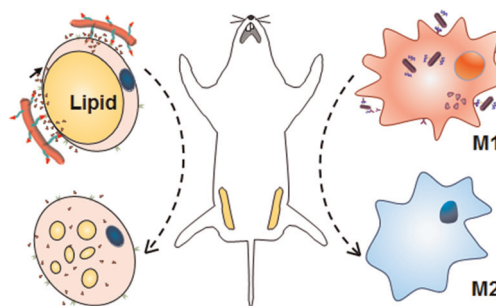
Zhisong Sun, Mengyao Ren, Bingchen Shan,* Qiang Yang, Ziyin Zhao, Xun Liu* and Lichen Yin*



5663

Injectable cell-targeting fiber rods to promote lipolysis and regulate inflammation for obesity treatment

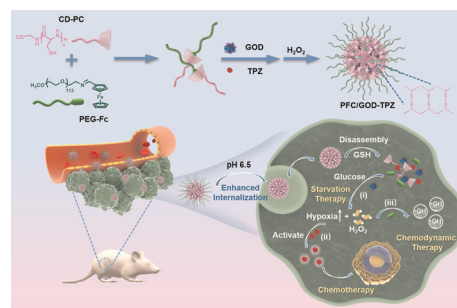
Xinyan Tao, Yuan Liu, Zhenhua Ding, Shuang Xie, Wenxiong Cao and Xiaohong Li*

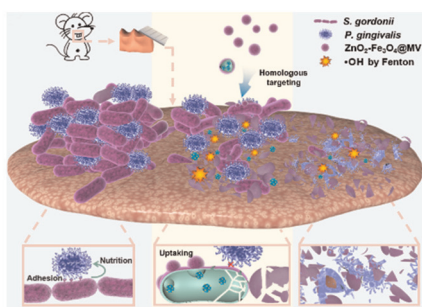
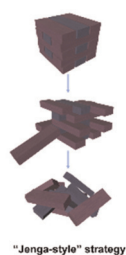


5674

pH/GSH dual-responsive supramolecular nanomedicine for hypoxia-activated combination therapy

Chang Du, Chenwei Wang, Shu-Heng Jiang, Xiangqin Zheng, Zelong Li, Yong Yao, Yue Ding,* Tingting Chen* and Huan Yi*





Efficient clearance of periodontitis pathogens by *S. gordonii* membrane-coated H₂O₂ self-supplied nanocomposites in a "Jenga" style

Qinghua Cao, Xiang Xiao, Chengcheng Tao, Rui Shi,*
Rui Lv, Ruochen Guo, Xinyi Li, Baiyan Sui, Xin Liu and
Jian Liu*

