



Lab on a Chip

Devices and applications at the micro- and nanoscale
rsc.li/loc

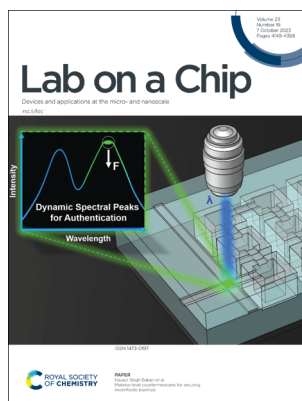
The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

IN THIS ISSUE

ISSN 1473-0197 CODEN LCAHAM 23(19) 4149-4368 (2023)



Cover
See Jesse Greener *et al.*,
pp. 4201–4212.
Image reproduced by
permission of Jesse Greener
and Clyde Henry from
Lab Chip, 2023, 23, 4201.



Inside cover
See Navajit Singh Baban *et al.*,
pp. 4213–4231.
Image reproduced by
permission of Navajit Singh Baban
from *Lab Chip*, 2023, 23, 4213.

EDITORIAL

4157

Celebrating the 30th anniversary of a pioneering microfluidics paper

Z. Hugh Fan* and D. Jed Harrison*

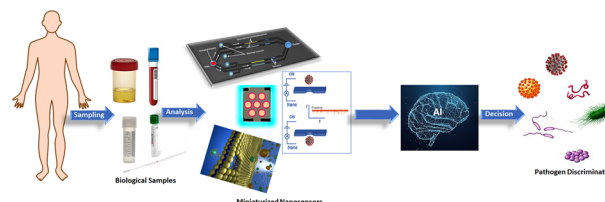


CRITICAL REVIEWS

4160

Advances in miniaturized nanosensing platforms for analysis of pathogenic bacteria and viruses

Abdallah M. Zeid, Islam M. Mostafa, Baohua Lou* and Guobao Xu*



Editorial Staff

Executive Editor

Rebecca Garton

Deputy Editor

Alice Smallwood

Editorial Production Manager

Sarah Whitehouse

Development Editor

David Lake

Publishing Editors

Gabriel Clarke, Derya Kara-Fisher,
Emma Stephen, Ziva Whitelock

Editorial Assistant

Leo Curtis

Publishing Assistant

Andrea Whiteside

Publisher

Jeanne Andres

For queries about submitted papers please contact Sarah Whitehouse, Editorial Production Manager, in the first instance. E-mail: loc@rsc.org

For pre-submission queries please contact Rebecca Garton, Executive Editor.

E-mail: loc-rsc@rsc.org

Lab on a Chip (electronic: ISSN 1473-0189) 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: £1617; US\$2902. 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

Lab on a Chip

Devices and applications at the micro- and nanoscale

rsc.li/loc

Lab on a Chip provides a unique forum for the publication of significant and original work related to miniaturisation, at the micro- and nano-scale, of interest to a multidisciplinary readership. The journal seeks to publish work at the interface between physical technological advancements and high impact applications that are of direct interest to a broad audience.

Editorial board

Editor-in-Chief

Aaron Wheeler, University of Toronto, Canada

Associate Editors

Jean-Christophe Baret, University of

Bordeaux

Yoon-Kyoung Cho, UNIST, South Korea

Amy Herr, University of California, Berkeley,

USA

Séverine Le Gac, University of Twente,

The Netherlands

Hang Lu, Georgia Institute of Technology, USA

Xingyu Jiang, Southern University of Science

and Technology, Shenzhen, China

Manabu Tokeshi, Hokkaido University, Japan

Hongkai Wu, Hong Kong University of Science

and Technology, China

Advisory Board

Esther Amstad, Swiss Federal Institute of

Technology in Lausanne (EPFL), Switzerland

Yoshinobu Baba, Nagoya University, Japan

Holger Becker, microfluidic ChipShop GmbH,

Germany

Anja Boisen, Technical University of Denmark,

Denmark

Oscar Ces, Imperial College London, UK

Dino Di Carlo, University of California, Los

Angeles, USA

Stephanie Descroix, Institut Curie, France

Petra Dittrich, ETH Zurich, Switzerland

Xudong Fan, University of Michigan, USA

Qun Fang, Zhejiang University, China

Albert Folch, University of Washington, USA

Piotr Garstecki, Institute of Physical Chemistry

of the Polish Academy of Sciences, Poland

Martin A. M. Gijs, EPFL, Switzerland

Mark Gilligan, Dolomite, UK

Keisuke Goda, University of Tokyo, Japan

Mei He, University of Kansas, USA

Tony Jun Huang, Duke University, USA

Yanyi Huang, Peking University, China

Daniel Irimia, Massachusetts General

Hospital, USA

David Issadore, University of Pennsylvania,

USA

Noo Li Jeon, Seoul National University, South

Korea

Michelle Khine, University of California,

Irvine, USA

Sunghoon Kwon, Seoul National University,

South Korea

Wilbur Lam, Georgia Institute of Technology

and Emory University, USA

Abraham Lee, University of California, Irvine,

USA

Gwo-Bin Lee, National Tsing Hua University,

Taiwan

Weihsia Li, University of Wollongong, Australia

Xiujun Li, University of Texas at El Paso, USA

Chwee Teck Lim, National University of

Singapore, Singapore

Ai Qun Liu, The Hong Kong Polytechnic

University, China

Adrian Neild, Monash University, Australia

Australia

Nicole Pamme, Stockholm University, Sweden

Ian Papautsky, University of Illinois at Chicago,

USA

Jianhua Qin, Dalian Institute of Chemical

Physics, China

Sámuel Sánchez, Institute of Bioengineering of

Catalonia, Spain

Anderson Shum, University of Hong Kong,

China

David Sinton, University of Toronto, Canada

Shoji Takeuchi, University of Tokyo, Japan

Sindy Tang, Stanford University, USA

Yi-Chin Toh, Queensland University of

Technology, Australia

Albert van den Berg, University of Twente,

The Netherlands

Joel Voldman, Massachusetts Institute of

Technology, USA

Jeff Tza-Huei Wang, Johns Hopkins University,

USA

David Weitz, Harvard University, USA

George Whitesides, Harvard University, USA

Chaoyong James Yang, Xiamen University,

China

Po Ki Yuen, Corning Incorporated, New

York, USA

Roland Zengerle, Hahn-Schickard, Germany

Weian Zhao, University of California, Irvine,

USA

Information for Authors

Full details on how to submit material for publication in Lab on a Chip 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/loc

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.

© The paper used in this publication meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).

Registered charity number: 207890

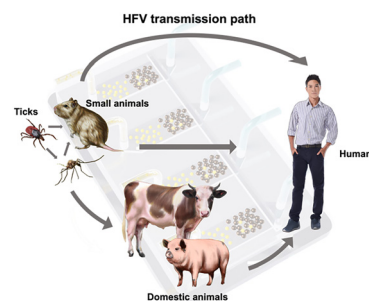


CRITICAL REVIEWS

4173

Micro- and nanosystems for the detection of hemorrhagic fever viruses

Mengdi Bao, Jacob Waitkus, Li Liu, Yu Chang, Zhiheng Xu, Peiwu Qin, Juhong Chen and Ke Du*

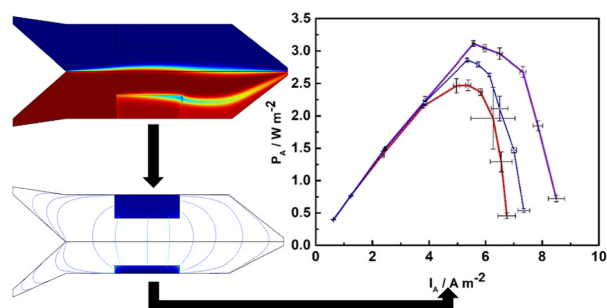


PAPERS

4201

Microfluidic membraneless microbial fuel cells: new protocols for record power densities

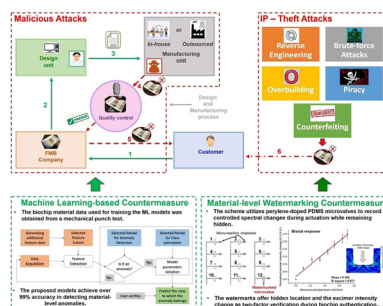
Nastaran Khodaparastasarabad, Jayesh M. Sonawane, Haleh Baghernavehsi, Lingling Gong, Linlin Liu and Jesse Greener*



4213

Material-level countermeasures for securing microfluidic biochips

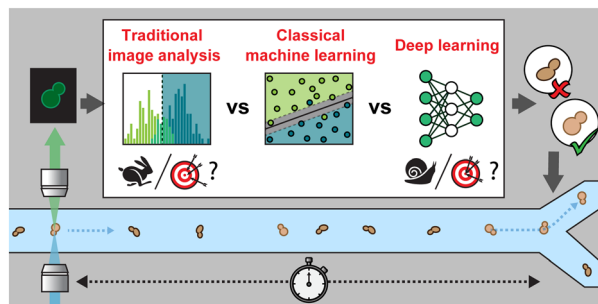
Navajit Singh Baban,* Sohini Saha, Sofija Jancheska, Inderjeet Singh, Sachin Khapli, Maksat Khobdabayev, Jongmin Kim, Sukanta Bhattacharjee, Yong-Ak Song, Krishnendu Chakrabarty and Ramesh Karri



4232

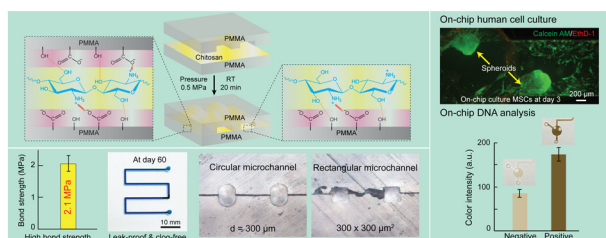
Is AI essential? Examining the need for deep learning in image-activated sorting of *Saccharomyces cerevisiae*

Mika Hayashi, Shinsuke Ohnuki, Yating Tsai, Naoko Kondo, Yuqi Zhou, Hongqian Zhang, Natsumi Tiffany Ishii, Tianben Ding, Maik Herbig, Akihiro Isozaki,* Yoshikazu Ohya* and Keisuke Goda*



PAPERS

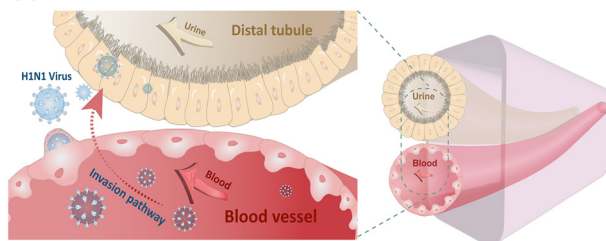
4245



Chitosan: a green adhesive for surface functionalization and fabrication of thermoplastic biomedical microdevices

Kieu The Loan Trinh, Duc Anh Thai, Da Hyun Yang and Nae Yoon Lee*

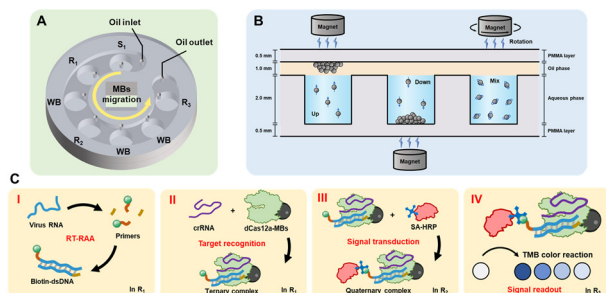
4255



Distal renal tubular system-on-a-chip for studying the pathogenesis of influenza A virus-induced kidney injury

Yueyue Huangfu, Ji Wang, Jiao Feng and Zhi-Ling Zhang*

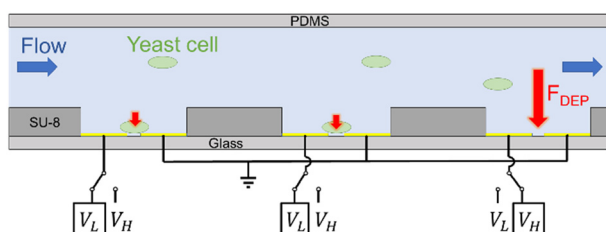
4265



Magnetofluid-integrated biosensors based on DNase-dead Cas12a for visual point-of-care testing of HIV-1 by an up and down chip

Di Huang, Yekai Zhao, Mengjun Fang, Peijie Shen, Hu Xu, Yichen He, Shengfu Chen, Zhenjun Si and Zhinan Xu*

4276



Full-electric microfluidic platform to capture, analyze and selectively release single cells

Ruben Van den Eeckhoudt*, An-Sofie Christiaens, Frederik Ceyssens, Vasileios Vangalis, Kevin J. Verstrepen, Nico Boon, Filip Tavernier, Michael Kraft and Irene Taurino

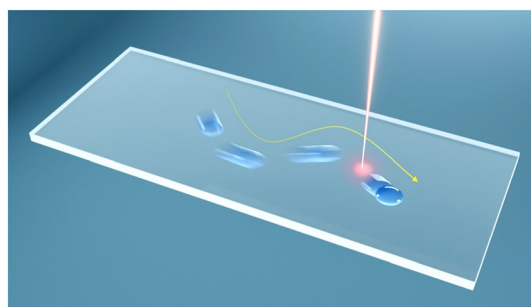


PAPERS

4287

Light-manipulated binary droplet transport on a high-energy surface

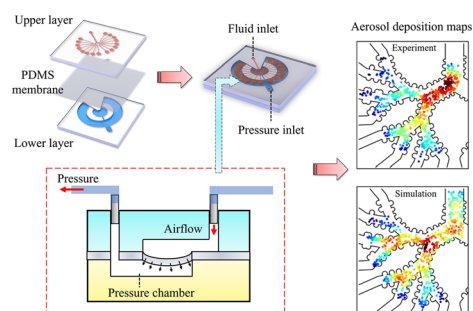
Wei Li, Dongliang Li, Xun Zhu, Dingding Ye, Yang Yang, Hong Wang, Rong Chen* and Qiang Liao



4302

Design of a multilayer lung chip with multigenerational alveolar ducts to investigate the inhaled particle deposition

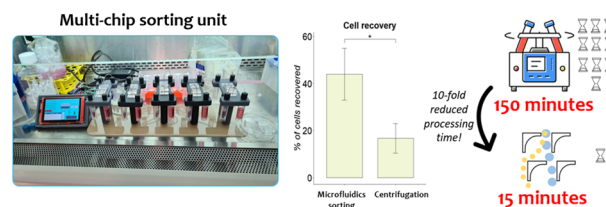
Yan Qiu, Chao Lu, Fubing Bao and Guoqing Hu*



4313

Scalable mesenchymal stem cell enrichment from bone marrow aspirate using deterministic lateral displacement (DLD) microfluidic sorting

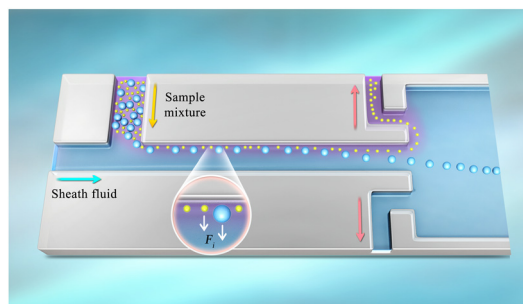
Nicholas Tan Kwan Zen, Kerwin Kwek Zeming, Kim Leng Teo, Mavis Loberas, Jialing Lee, Chin Ren Goh, Da Hou Yang, Steve Oh, James Hui Hoi Po, Simon M. Cool, Han Wei Hou* and Jongyoon Han*



4324

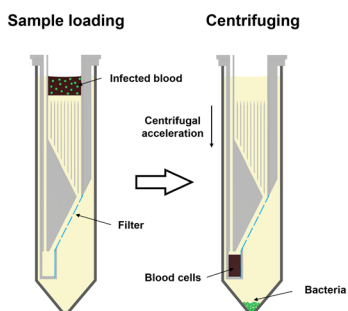
Reverse flow enhanced inertia pinched flow fractionation

Saijie Wang, Quanchen Xu, Zhihan Zhang, Shengbo Chen, Yizhou Jiang, Zhuowei Feng, Dou Wang* and Xingyu Jiang*



PAPERS

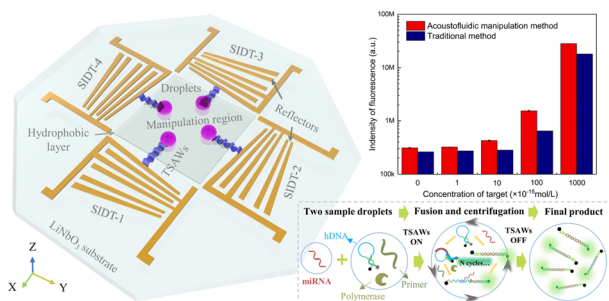
4334



Efficient filter-in-centrifuge separation of low-concentration bacteria from blood

Kaiyang Zeng, Mohammad Osaid and Wouter van der Wijngaart*

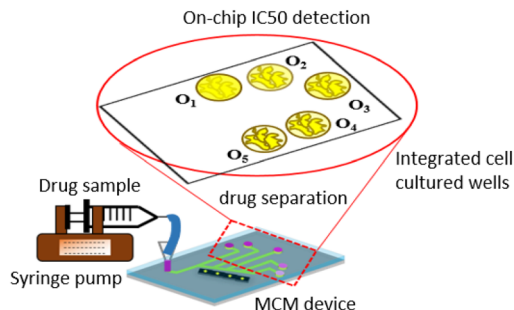
4343



Acoustofluidics for simultaneous droplet transport and centrifugation facilitating ultrasensitive biomarker detection

Jingui Qian, Huaize Lan, Liang Huang, Shaohui Zheng, Xuefeng Hu,* Minghui Chen,* Joshua E.-Y. Lee and Wei Zhang*

4352



A magnetically controlled microfluidic device for concentration dependent *in vitro* testing of anticancer drug

Vinit Kumar Yadav, Preetha Ganguly, Prashant Mishra, Samaresh Das and Dhiman Mallick*

CORRECTION

4366

Correction: Design and validation of a flowless gradient generating microfluidic device for high-throughput drug testing

Ketaki Bachal, Shital Yadav, Prasanna Gandhi and Abhijit Majumder*

