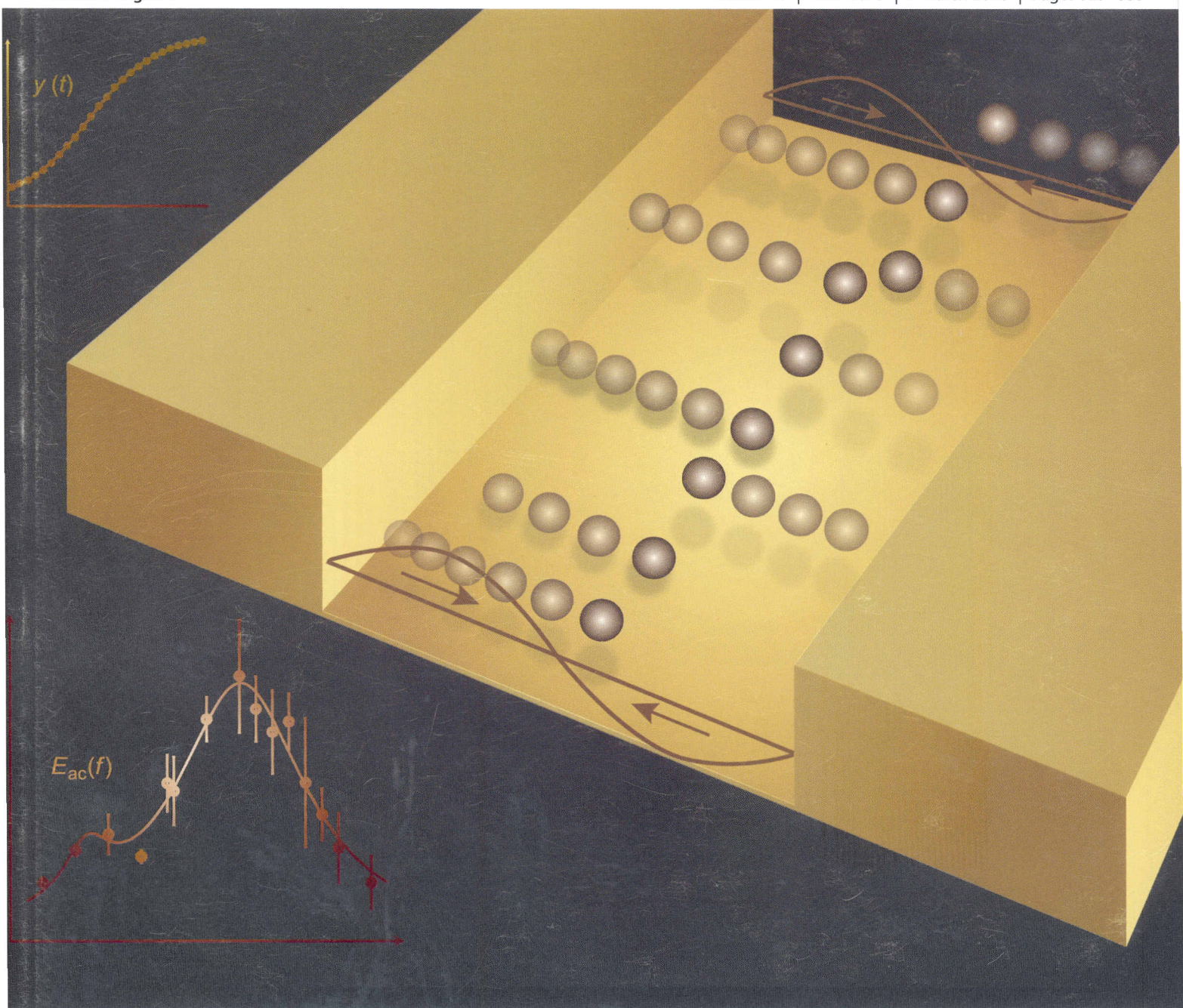


Lab on a Chip

Micro- & nano- fluidic research for chemistry, physics, biology, & bioengineering

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Volume 10 | Number 5 | 7 March 2010 | Pages 529–668



ISSN 1473-0197

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Bruus
Measuring acoustics

Lagally
SPR imaging arrays



1473-0197(2010)10:5;1-C

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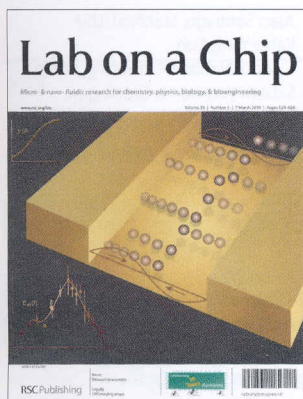
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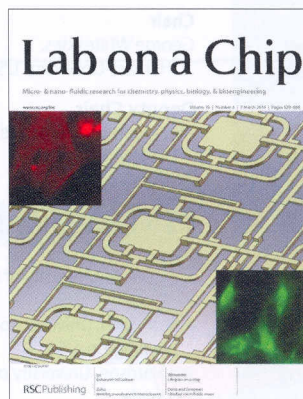
IN THIS ISSUE

ISSN 1473-0197 CODEN LCAHAM 10(5) 529–668 (2010)



Cover

See Bruus *et al.*, pp. 563–570. Based on particle tracking and subsequent curve fitting to the observed paths, we measure *in situ* the local ultrasound pressure amplitude in microfluidic chips designed for acoustophoresis of particle suspensions. Image reproduced by permission of Henrik Bruus from *Lab Chip*, 2010, **10**, 563.



Inside cover

See Lu *et al.*, pp. 571–580. An array of microfluidic chambers with bridge-and-underpass architecture, enabling continuous perfusion without cross-chamber contamination for cell culture and assay. Image reproduced by permission of Hang Lu from *Lab Chip*, 2010, **10**, 571.

HIGHLIGHT

541

Research Highlights

Petra S. Dittrich*

Petra Dittrich reviews the current literature in miniaturisation and related technologies.



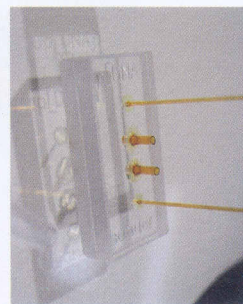
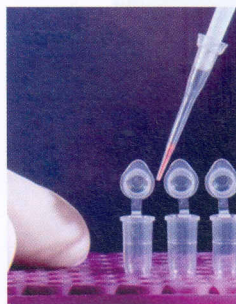
FOCUS

544

Microfluidics for the upstream pipeline of DNA sequencing – a worthy application?

Paul Coupland*

Technology for DNA sequencing is progressing at a fantastic speed, but this cannot be said for the DNA sample preparation part of the pipeline. Can microfluidics fill this technology gap?

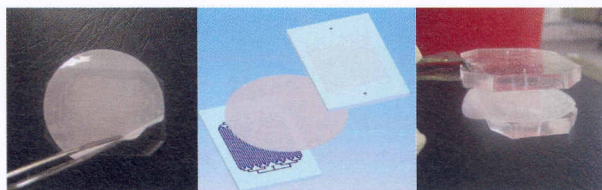


548

Irreversible, direct bonding of nanoporous polymer membranes to PDMS or glass microdevices

Kiana Aran, Lawrence A. Sasso, Neal Kamdar and Jeffrey D. Zahn*

Porous polymer membranes are bonded directly to standard microdevices at room temperature without adhesives. A strong and irreversible bond is achieved by modifying the membrane surface using 3-aminopropyltriethoxysilane (APTES).

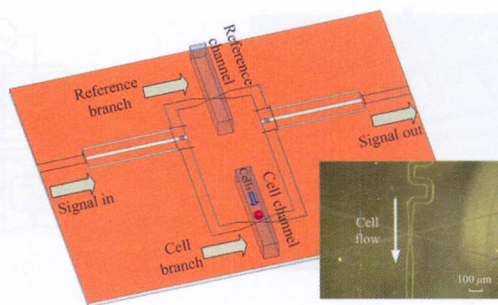


553

Distinguishing the viability of a single yeast cell with an ultra-sensitive radio frequency sensor

Yang Yang, Hanqiao Zhang, Junjie Zhu, Gaoyan Wang, Tzuen-Rong Tzeng, Xiangchun Xuan, Kama Huang and Pingshan Wang*

We propose and demonstrate a simple, ultra sensitive radio frequency (RF) sensor to detect a single yeast cell and distinguish its viability in a microfluidic channel. On-chip interference is used to cancel background probing signals to improve sensor sensitivity.

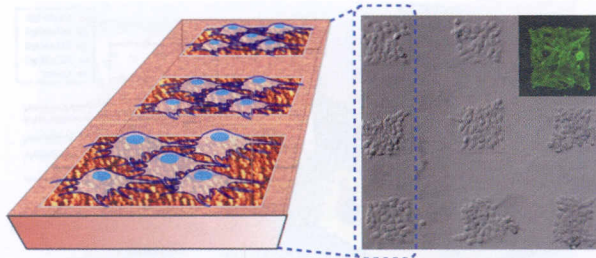


556

Observation of enhanced cell adhesion and transfection efficiency on superhydrophobic surfaces

Jau-Ye Shiu, Chiung-Wen Kuo, Wha-Tzong Whang and Peilin Chen*

It was found that cells attached preferentially on the roughened area of patterned superhydrophobic surfaces allowing the formation of cell microarrays with the advantages of improved cell adhesion, natural separation of colonies and enhanced transfection efficiency.



559

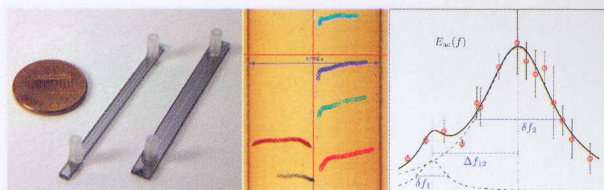
On-demand droplet release for droplet-based microfluidic system

Wei Wang, Chun Yang, YingShuai Liu and Chang Ming Li*

On-demand droplet release from a microwell was successfully implemented and combined with droplet trapping/fusion functions to make an ideal and integrated droplet based microfluidic platform.



563

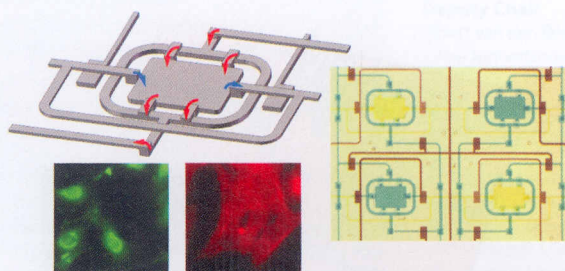


Measuring the local pressure amplitude in microchannel acoustophoresis

Rune Barnkob, Per Augustsson, Thomas Laurell and Henrik Bruus*

Based on particle tracking and subsequent curve fitting to the observed paths, we measure *in situ* the local ultrasound pressure amplitude in microfluidic chips designed for acoustophoresis of particle suspensions.

571

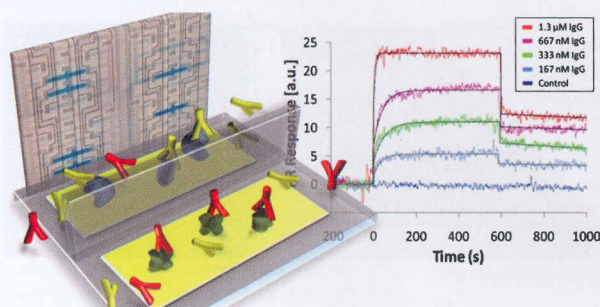


Continuously perfused, non-cross-contaminating microfluidic chamber array for studying cellular responses to orthogonal combinations of matrix and soluble signals

Edward S. Park, Ashley C. Brown, Michael A. DiFeo, Thomas H. Barker and Hang Lu*

This paper presents a microfluidic array of individually addressable chambers that are continuously perfused, do not cross-communicate, and exhibit low shear for studying cell behaviour under combinatorial conditions.

581



Parallel microfluidic surface plasmon resonance imaging arrays

Eric Ouellet, Christopher Lausted, Tao Lin, Cheng Wei T. Yang, Leroy Hood and Eric T. Lagally*

We demonstrate the use of a 264 element-addressable chamber array with integrated on-board serial dilution network for the multiplexed analysis of multiple protein targets to several analyte streams using surface plasmon resonance imaging as a detection tool. Controlled recovery of individual protein samples for downstream processing was also achieved after performing kinetic analyses.

589



Lifespan-on-a-chip: microfluidic chambers for performing lifelong observation of *C. elegans*

S. Elizabeth Hulme, Sergey S. Shevkoplyas, Alison P. McGuigan, Javier Apfeld, Walter Fontana and George M. Whitesides*

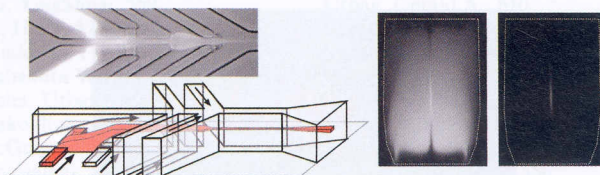
We describe a microfluidic device for the culture and examination of the nematode *C. elegans* throughout its entire adult lifespan. The device enabled longitudinal tracking of age-related changes in locomotion and body size, and the correlation of these changes with lifespan.

598

Ultrafast microfluidic mixer with three-dimensional flow focusing for studies of biochemical kinetics

Yann Gambin, Claire Simonnet, Virginia VanDelinder, Ashok Deniz* and Alex Groisman*

We present a laminar microfluidic mixer for kinetic studies with 10 μ s buffer exchange time and 3D-flow focusing, greatly simplifying sample interrogation and evaluation of the reaction time.

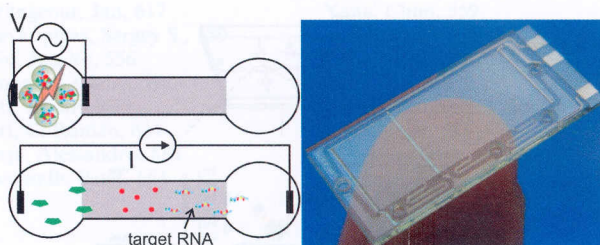


610

A microfluidic approach for high efficiency extraction of low molecular weight RNA

Paul Vulto,* Gregory Dame, Urban Maier, Solomzi Makohliso, Susann Podszun, Peter Zahn and Gerald A. Urban

This paper describes a new approach to RNA extraction from whole cells. Combination with newest microfluidic techniques results in a fully automated lab-on-a-chip that is faster and simpler than any competing technique.

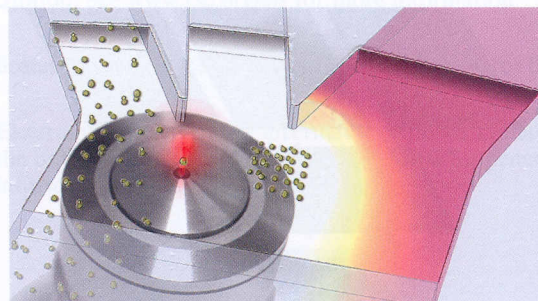


617

A microfluidic device for reversible environmental changes around single cells using optical tweezers for cell selection and positioning

Emma Eriksson, Kristin Sott, Fredrik Lundqvist, Martin Sveningsson, Jan Scrimgeour, Dag Hanstorp, Mattias Goksör and Annette Granéli*

A microfluidic device for quantitative studies of signalling transduction pathways that are activated by environmental changes is presented. Optical tweezers are used for selection and positioning of cells within the device.

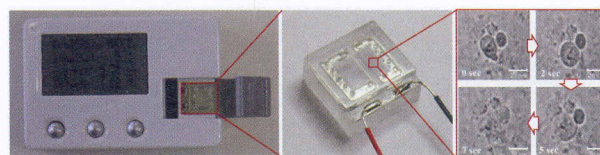


626

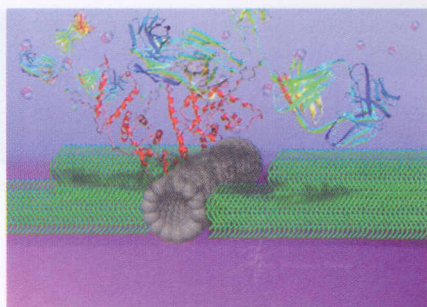
Electrochemical cell lysis device for DNA extraction

Hun Joo Lee, Joon-Ho Kim,* Hee Kyun Lim, Eun Chol Cho, Nam Huh, Christopher Ko, Jae Chan Park, Jeong-Woo Choi and Soo Suk Lee*

We present an electrochemical cell lysis micro-device for rapid DNA sample preparation with advantages over conventional methods, including high lysis efficiency, absence of chemical reagents, and no adverse effects on PCR amplification.



634

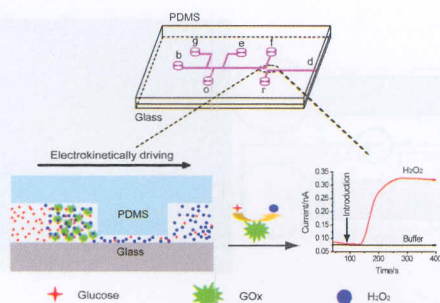


Femtomolar detection of 2,4-dichlorophenoxyacetic acid herbicides *via* competitive immunoassays using microfluidic based carbon nanotube liquid gated transistor

I Putu Mahendra Wijaya, Tey Ju Nie, Sonu Gandhi, Robin Boro, Alagappan Palaniappan, Goh Wei Hau, Isabel Rodriguez,* C. Raman Suri and Subodh G. Mhaisalkar*

A competitive immunoassay is introduced in a microfluidic-based liquid-gated transistor for femto-molar label-free electrical detection of herbicide in soil extract.

639

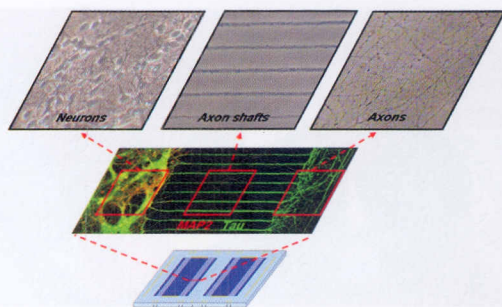


Study on the kinetics of homogeneous enzyme reactions in a micro/nanofluidics device

Chen Wang, Su-Juan Li, Zeng-Qiang Wu, Jing-Juan Xu, Hong-Yuan Chen and Xing-Hua Xia*

In this paper, a micro/nanofluidic preconcentration device integrated with an electrochemical detector has been used to study the enrichment of enzymes and homogeneous enzyme reaction kinetics.

647

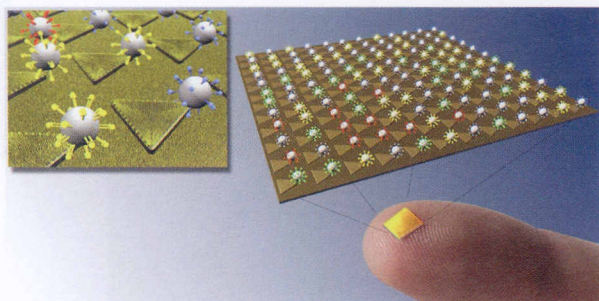


A lab-on-a-chip platform for studying the subcellular functional proteome of neuronal axons

Huei-Ing Wu, Gia-Her Cheng, Yi-Yun Wong, Chia-Min Lin, Weileun Fang, Wei-Yuan Chow and Yen-Chung Chang*

We report here a chip device which can be used to produce large quantities of pure neuronal axons for the study of their protein and RNA components. This device and its modified versions are powerful tools in addressing various issues in the functional proteomics of neuronal axons under normal and pathological conditions.

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A magnetic microchip for controlled transport of attomole levels of proteins

LarsErik Johansson, Klas Gunnarsson,* Stojanka Bijelovic, Kristofer Eriksson, Alessandro Surpi, Emmanuelle Göthelid, Peter Svedlindh and Sven Oscarsson

We report on a novel method of controlled transport of proteins immobilized to micron sized magnetic beads in a lab-on-a-chip environment without the need of microchannels.