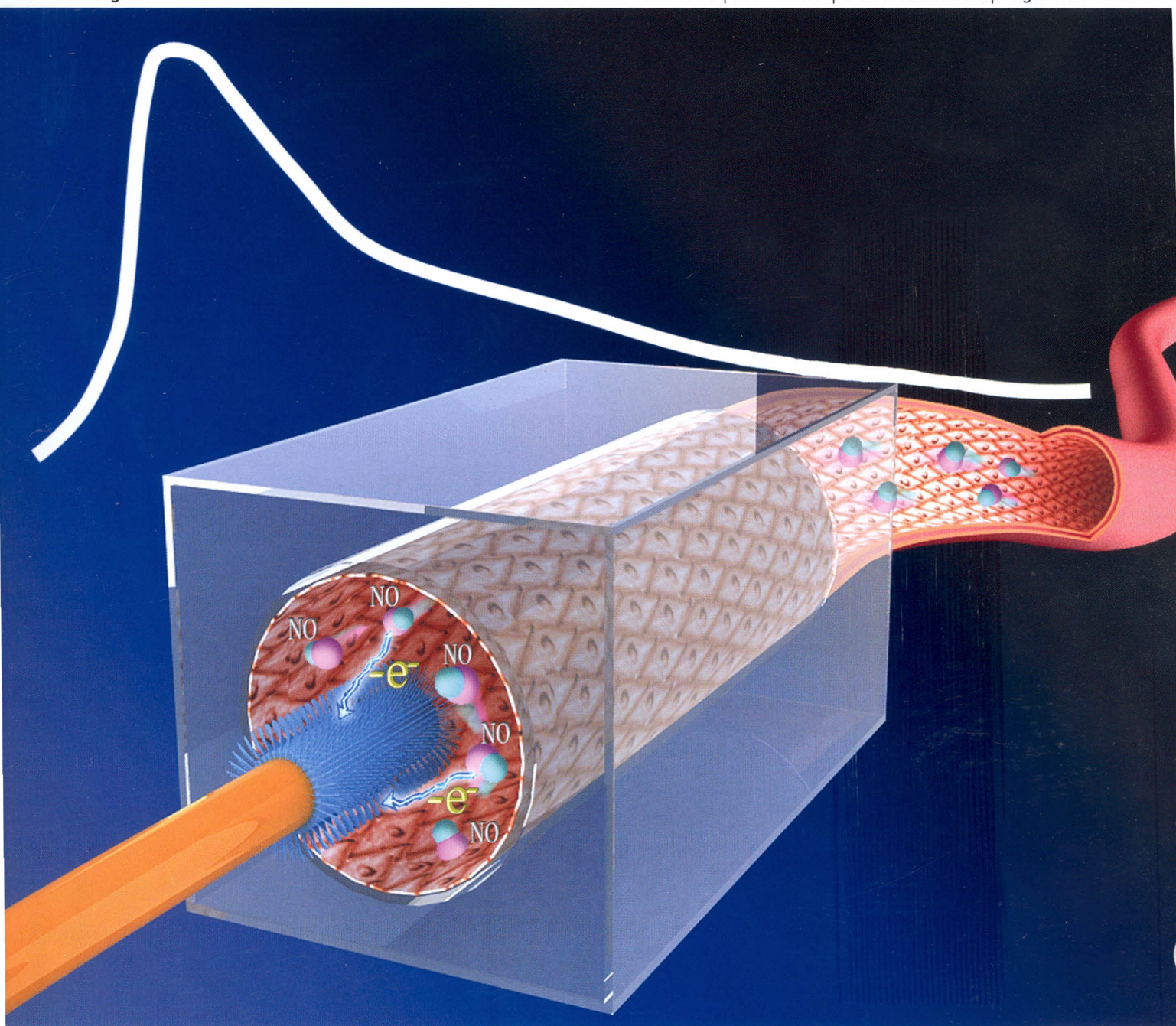


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PAPER

Wei-Hua Huang, Kai-Fu Huo *et al.*

Vascular lumen simulation and highly-sensitive nitric oxide detection using three-dimensional gelatin chip coupled to TiC/C nanowire arrays microelectrode



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Cover

See Wei-Hua Huang, Kai-Fu Huo *et al.*, pp. 4249–4256. Image reproduced by permission of Wei-Hua Huang from *Lab Chip*, 2012, 12, 4249.



Inside cover

See Tony Jun Huang *et al.*, pp. 4228–4231. Image reproduced by permission of Tony Jun Huang from *Lab Chip*, 2012, 12, 4228.

HIGHLIGHT

4213

Research highlights

Adnan Memic, Huaibin Eli Zhang, Sang Bok Kim, Mehmet R. Dokmeci and Ali Khademhosseini*

Lensless imaging of moving objects – Microdroplets as biofactories – Acoustic tweezers for particle manipulation.



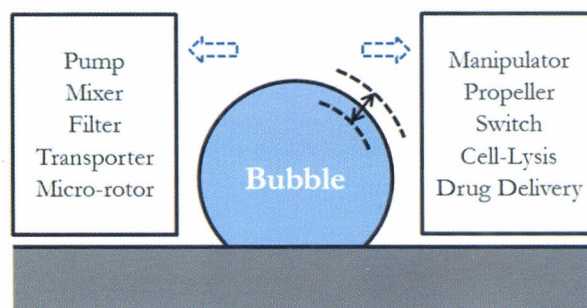
CRITICAL REVIEW

4216

Oscillating bubbles: a versatile tool for lab on a chip applications

Ali Hashmi, Gan Yu, Marina Reilly-Collette, Garrett Heiman and Jie Xu*

The article aims to highlight the immense potential that oscillating microbubbles hold for emerging lab on a chip applications.

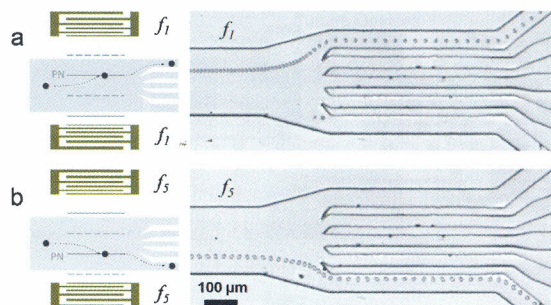


4228

Standing surface acoustic wave (SSAW) based multichannel cell sorting

Xiaoyun Ding, Sz-Chin Steven Lin, Michael Ian Lapsley, Sixing Li, Xiang Guo, Chung Yu Chan, I-Kao Chiang, Lin Wang, J. Philip McCoy and Tony Jun Huang*

A standing surface acoustic wave (SSAW) based cell sorting technique that can guide cells into five separate outlet channels in one step.



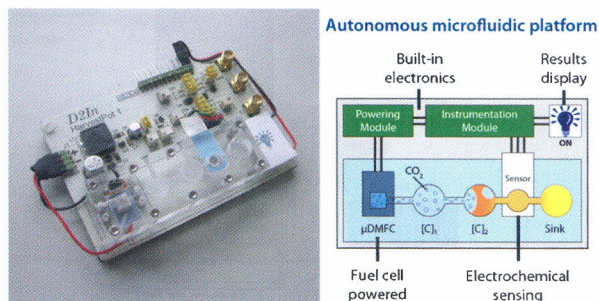
TECHNICAL INNOVATIONS

4232

Fuel cell-powered microfluidic platform for lab-on-a-chip applications: Integration into an autonomous amperometric sensing device

J. P. Esquivel,* J. Colomer-Farrarons, M. Castellarnau, M. Salleras, F. J. del Campo, J. Samitier, P. Miribel-Català and N. Sabaté

A micro fuel cell provides electric and hydraulic power to perform electrochemical sensing and display the result, within a compact microfluidic platform.

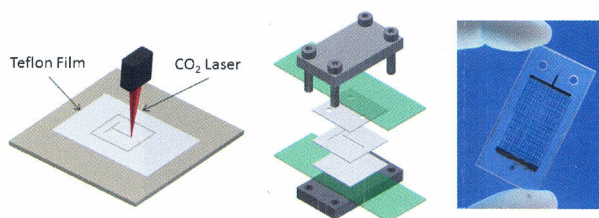


4236

Laminated thin-film Teflon chips for petrochemical applications

Thomas W. de Haas, Hossein Fadaei and David Sinton*

We present a method for rapidly fabricating solvent resistant, thin-film Teflon microfluidic chips and demonstrate their potential in petrochemical applications.

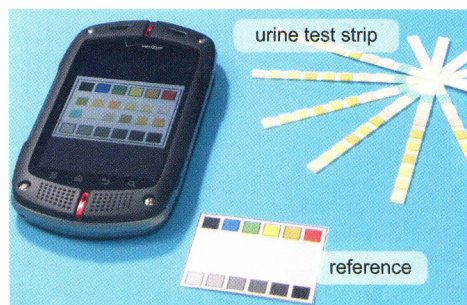


4240

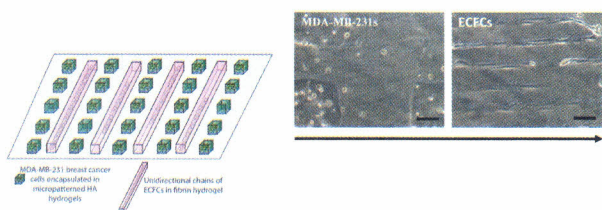
Point-of-care colorimetric detection with a smartphone

Li Shen, Joshua A. Hagen and Ian Papautsky*

We introduce a novel approach of quantifying colors of colorimetric diagnostic assays with a smartphone that allows for high accuracy measurements in a wide range of ambient conditions.



4244

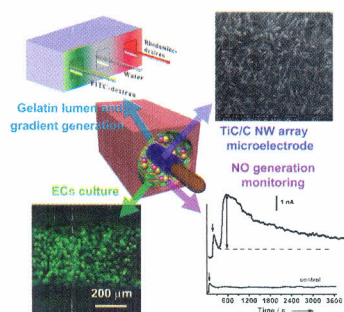


Patterning microscale extracellular matrices to study endothelial and cancer cell interactions *in vitro*

Laura E. Dickinson, Cornelis Lütgebaucks, Daniel M. Lewis and Sharon Gerecht*

We developed a novel microstructured co-culture system to investigate cell interactions in the tumor–vascular niche.

4249

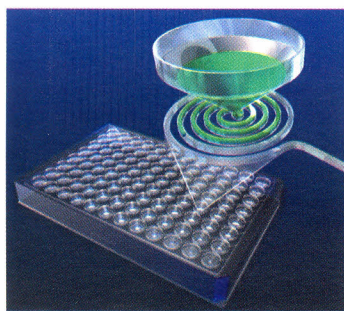


Vascular lumen simulation and highly-sensitive nitric oxide detection using three-dimensional gelatin chip coupled to TiC/C nanowire arrays microelectrode

Lin-Mei Li, Xue-Ying Wang, Liang-Sheng Hu, Rong-Sheng Chen, Ying Huang, Shi-Jing Chen, Wei-Hua Huang,* Kai-Fu Huo* and Paul K. Chu

A novel gelatin microfluidic chip for vascular lumen simulation and TiC/C NW arrays microelectrode for NO monitoring is reported.

4257

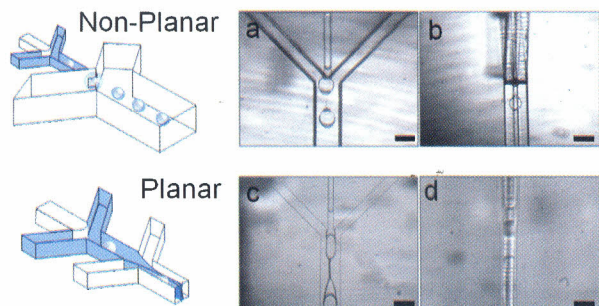


A novel microfluidic microplate as the next generation assay platform for enzyme linked immunoassays (ELISA)

Junhai Kai,* Aniruddha Puntambekar, Nelson Santiago, Se Hwan Lee, David W. Sehy, Victor Moore, Jungyoun Han and Chong H. Ahn

A novel ELISA microplate, combining microfluidics with standard-96 well architecture is presented, allowing for low-volume, rapid, and high-sensitivity immunoassay protocols.

4263



Drop formation in non-planar microfluidic devices

Assaf Rotem,* Adam R. Abate, Andrew S. Utada, Volkert Van Steijn and David A. Weitz

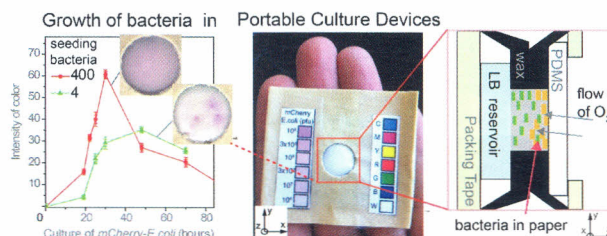
We fabricate non-planar microfluidic drop makers, study how drop making depends on the devices' wettability, and show how to produce multiple emulsions with non-planar devices.

4269

Portable self-contained cultures for phage and bacteria made of paper and tape

Maribel Funes-Huacca, Alyson Wu, Eszter Szepesvari, Pavithra Rajendran, Nicholas Kwan-Wong, Andrew Razgulin, Yi Shen, John Kagira, Robert Campbell and Ratmir Derda

In this paper, we demonstrate that a functional, portable device for the growth of bacteria or amplification of bacteriophage can be created using simple materials.

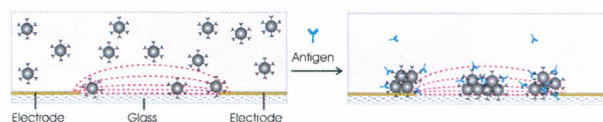


4279

On-chip latex agglutination immunoassay readout by electrochemical impedance spectroscopy

Shalini Gupta, Peter K. Kilpatrick, Elizabeth Melvin and Orlin D. Velev*

Interdigitated microelectrodes can be used to electrically detect immunospecific particle aggregation in latex agglutination tests (LATs).

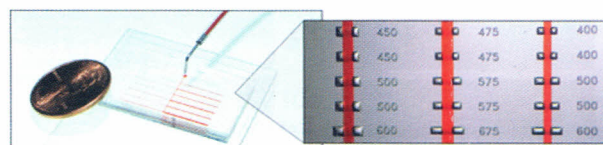


4287

Systematic characterization of feature dimensions and closing pressures for microfluidic valves produced via photoresist reflow

P. M. Fordyce,* C. A. Diaz-Botia, J. L. DeRisi and R. Gomez-Sjoberg*

Multilayer soft lithography devices rely on small patches of photoresist rounded by reflow to create microfluidic valves. Here, we characterize how photoresist feature dimensions change during reflow and how final feature dimensions determine valve closing pressures.

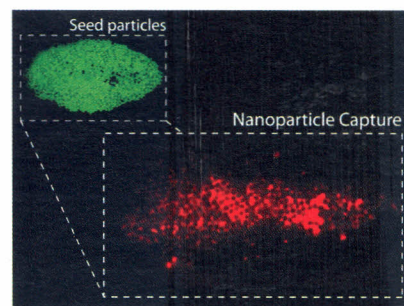


4296

Seed particle-enabled acoustic trapping of bacteria and nanoparticles in continuous flow systems

Björn Hammarström,* Thomas Laurell and Johan Nilsson

Seeding particles enables acoustic trapping below the size limit set by acoustic streaming, allowing enrichment/purification of small-sized and low-abundant microorganisms.

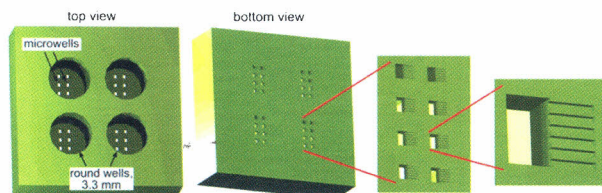


4305

Microwell devices with finger-like channels for long-term imaging of HIV-1 expression kinetics in primary human lymphocytes

Brandon S. Razoooky, Edgar Gutierrez, Valeri H. Terry, Celsa A. Spina, Alex Groisman* and Leor S. Weinberger*

A micro-device, which enables loading of non-adherent cells into micro-channels by gravity, is used for multiday time-lapse fluorescence microscopy of HIV-1 infected primary, patient-isolated CD4⁺ T lymphocytes with single-cell tracking.

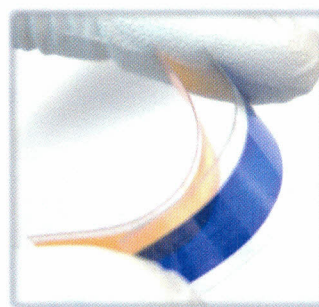


4313

Non-emissive plastic colour filters for fluorescence detection

M. Yamazaki, S. Krishnadasan, A. J. deMello and J. C. deMello*

We report non-fluorescent plastic colour filters based on dye-sensitised titania that provide a low-cost alternative to interference filters for applications requiring non-emissive filtering.

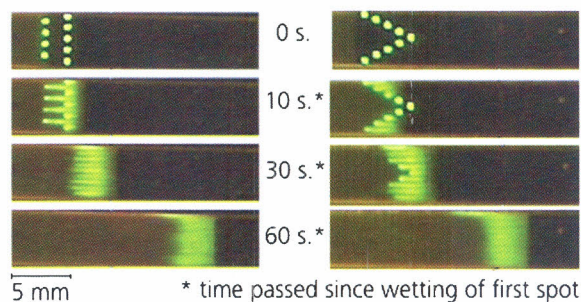


4321

Controlled release of dry reagents in porous media for tunable temporal and spatial distribution upon rehydration

Gina E. Fridley,* Huy Q. Le, Elain Fu and Paul Yager

Novel methods for printing patterns of reagents on porous membranes to achieve sophisticated control of the spatial and temporal concentration gradients that are created as reagents dissolve during capillary flow.

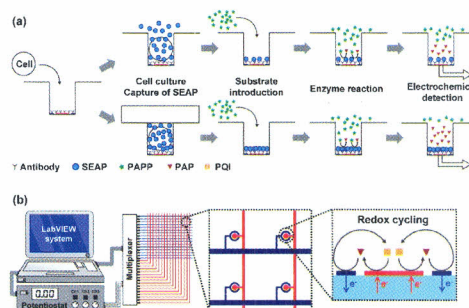


4328

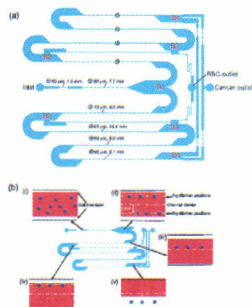
Accumulation and detection of secreted proteins from single cells for reporter gene assays using a local redox cycling-based electrochemical (LRC-EC) chip device

Mustafa Şen, Kosuke Ino,* Hitoshi Shiku and Tomokazu Matsue*

A lab-on-a-chip device is described for the electrochemical detection of alkaline phosphatase (ALP) secreted by transformed single HeLa cells.



4336

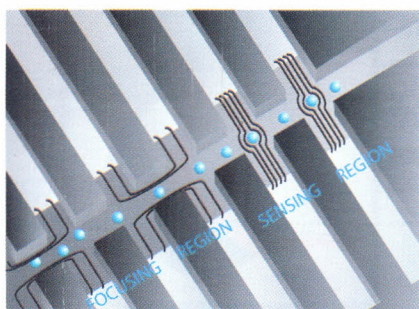


Separation of cancer cells from a red blood cell suspension using inertial force

Tatsuya Tanaka, Takuji Ishikawa,*
Keiko Numayama-Tsuruta, Yohsuke Imai,
Hironori Ueno, Noriaki Matsuki and Takami Yamaguchi

The circulating tumor cell test has recently become popular for evaluating prognosis and treatment efficacy in cancer patients.

4344

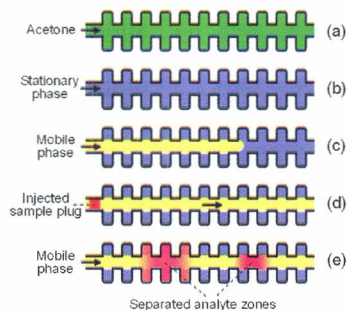


Characterization of a novel impedance cytometer design and its integration with lateral focusing by dielectrophoresis

Guillaume Mernier,* Enri Duqi and Philippe Renaud

Impedance cytometer design with integrated cell focusing, based on the "liquid electrodes" concept.

4350

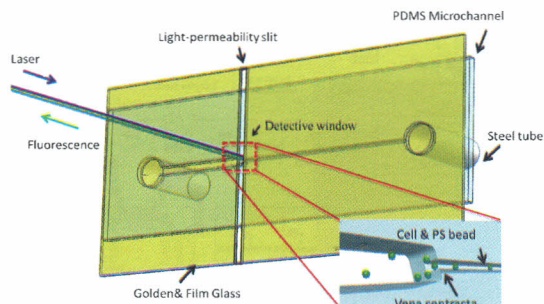


Microfluidic droplet-array liquid-liquid chromatography based on droplet trapping technique

Ying Zhu, Hong Chen, Guan-Sheng Du and Qun Fang*

We realized liquid-liquid chromatographic separation in a droplet-based microfluidic system using two arrays of picoliter-scale droplets immobilized on both sidewalls of a microchannel as stationary phase.

4355



A microfluidics cytometer for mice anemia detection

Yanrui Ju, Jian Song, Zhaoxin Geng, Hongze Zhang,
Wei Wang, Lide Xie, Weijuan Yao and Zhihong Li*

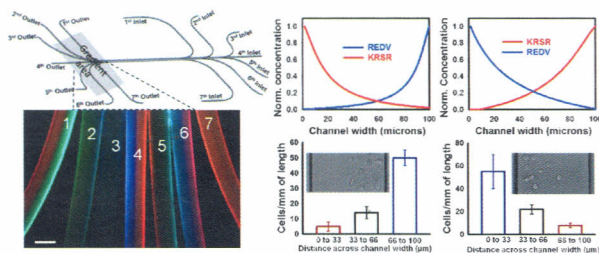
Design and fabrication of a microfluidic cytometer system and its application for reticulocyte detection are described.

4363

Generating multiplex gradients of biomolecules for controlling cellular adhesion in parallel microfluidic channels

Tohid Fatanat Didar and Maryam Tabrizian*

Here we present a microfluidic platform to generate multiplex gradients of biomolecules within parallel microfluidic channels, in which a range of multiplex concentration gradients with different profile shapes are simultaneously produced.

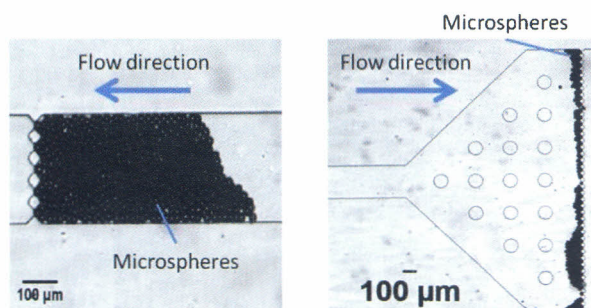


4372

Microspheres as resistive elements in a check valve for low pressure and low flow rate conditions

Kevin Ou, John Jackson, Helen Burt and Mu Chiao*

Microsphere-based check valves for low pressure and low flow rate ($Re < 1$) applications are reported.

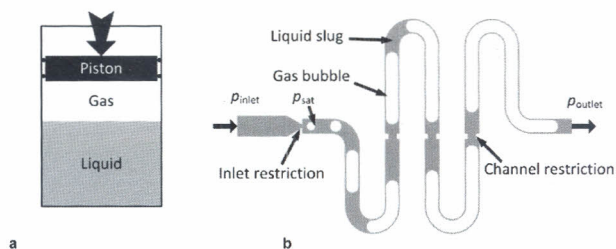


4381

Determining phase diagrams of gas-liquid systems using a microfluidic PVT

Farshid Mostowfi,* Shahnawaz Molla and Patrick Tabeling

A novel microfluidic device designed for analyzing phase diagrams of gas-liquid systems is described. We show that the measurement time for thermodynamic properties of gas-liquid systems is reduced from hours to minutes without compromising the measurement accuracy.

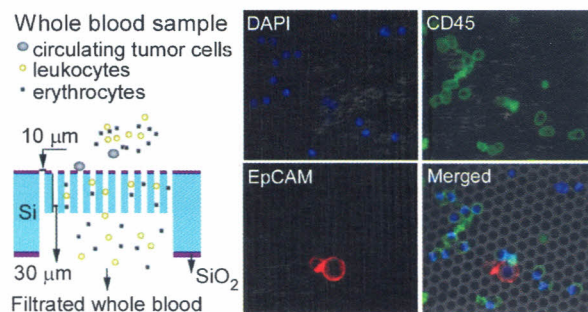


4388

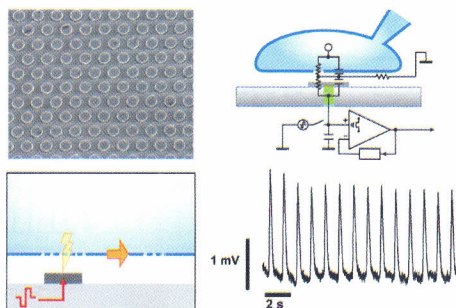
Microsieve lab-chip device for rapid enumeration and fluorescence *in situ* hybridization of circulating tumor cells

Li Shi Lim, Min Hu, Mo Chao Huang, Wai Chye Cheong, Alfred Tau Liang Gan, Xing Lun Looi, Sai Mun Leong, Evelyn Siew-Chuan Koay and Mo-Huang Li*

Circulating tumour cells within whole blood samples can be effectively detected using a silicon microsieve device.



4397

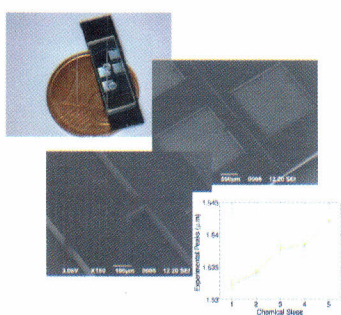


Open-cell recording of action potentials using active electrode arrays

Dries Braeken,* Danny Jans, Roeland Huys, Andim Stassen, Nadine Collaert, Luis Hoffman, Wolfgang Eberle, Peter Peumans and Geert Callewaert

We present open-cell action potential recording using active multi-electrode array chips. Intracellular access, possible at each of the 16 384 electrodes on the chip, was accomplished by local membrane electroporation using electrical stimulation with subcellular-sized electrodes.

4403

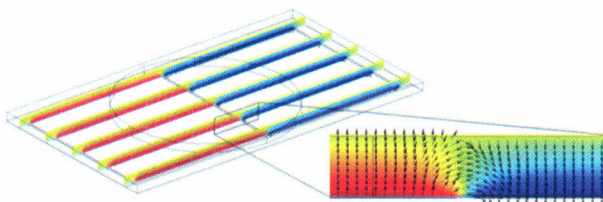


Optofluidic microsystems with integrated vertical one-dimensional photonic crystals for chemical analysis

S. Surdo, S. Merlo, F. Carpignano, L. M. Strambini, C. Trono, A. Giannetti, F. Baldini and G. Barillaro*

All-silicon, integrated optofluidic microsystems for optofluidic/biosensing applications, integrating high aspect-ratio photonic crystal (PhC) transducers together with microfluidic reservoirs/channels, for the infiltration of liquids in the PhC air gaps, and with fiber grooves, for alignment/positioning of readout optical fibers in front of the PhC, on the same silicon die.

4416

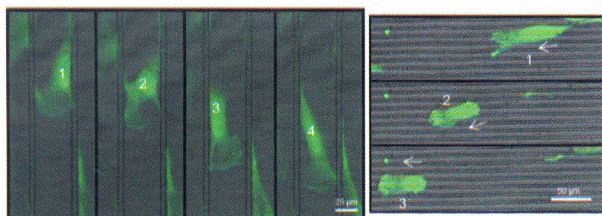


Droplet sensing by measuring the capacitance between coplanar electrodes in a digital microfluidic system

Biddut Bhattacharjee and Homayoun Najjaran

This paper introduces the method of droplet sensing by measuring the capacitance between two coplanar electrodes in the lower plate.

4424



Microfabricated mimics of *in vivo* structural cues for the study of guided tumor cell migration

Daniel Gallego-Perez, Natalia Higuera-Castro, Lisa Denning, Jessica DeJesus, Kirstin Dahl, Atom Sarkar and Derek J. Hansford*

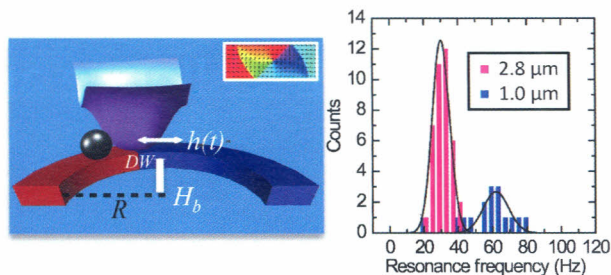
A platform was developed to resemble fiber- and conduit-like structural cues that modulate guided tumor cell migration during tumor dissemination/metastasis.

4433

Integrated capture, transport, and magneto-mechanical resonant sensing of superparamagnetic microbeads using magnetic domain walls

E. Rapoport, D. Montana and G. S. D. Beach*

Magnetic domain walls in ferromagnetic nanotracks can be used to trap, transport, sense and release superparamagnetic microbeads in a simple integrated on-chip system for lab-on-a-bead applications.

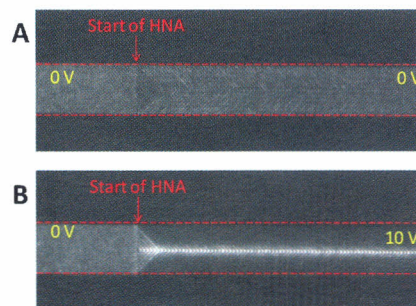


4441

Continuous-flow biomolecule concentration and detection in a slanted nanofilter array

Lih Feng Cheow, Hansen Bow and Jongyoon Han*

We demonstrate continuous-flow biomolecule concentration and molecular interaction detection using microfabricated periodic slanted sieving structures.

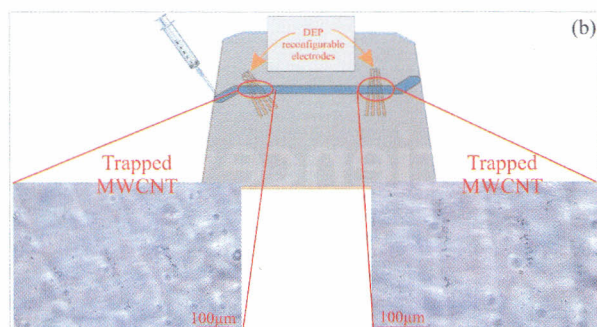


4449

All-optical microfluidic chips for reconfigurable dielectrophoretic trapping through SLM light induced patterning

Lisa Miccio,* Pasquale Memmolo, Simonetta Grilli and Pietro Ferraro

A new all-optical method for fabricating polymer microfluidic channels, and for in-situ reconfigurable and electrode-free DEP trapping by a photorefractive effect.

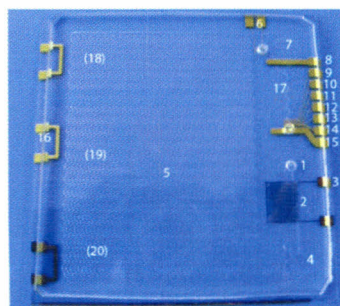


4455

An integrated PCR microfluidic chip incorporating aseptic electrochemical cell lysis and capillary electrophoresis amperometric DNA detection for rapid and quantitative genetic analysis

Sandeep Kumar Jha, Rohit Chand, Dawoon Han, You-Cheol Jang, Gyu-Sik Ra, Joung Sug Kim, Baek-Hie Nahm and Yong-Sang Kim*

The proposed lab-on-a-chip device can carry out reagentless lysis of most cell types, amplification of target DNA through on-chip PCR and quantitative analysis of DNA amplicon.

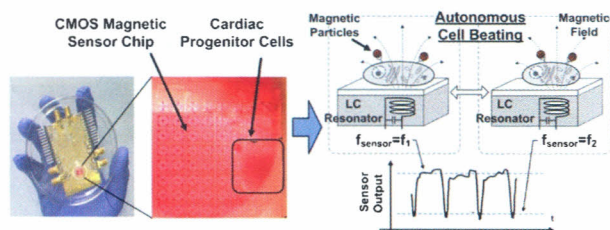


4465

A magnetic cell-based sensor

Hua Wang, Alborz Mahdavi, David A. Tirrell and Ali Hajimiri*

A new magnetic cell-based sensing platform based on a complementary metal-oxide semiconductor (CMOS) magnetic sensor chip and cardiac progenitor cells enables real-time detection of chemical agents.

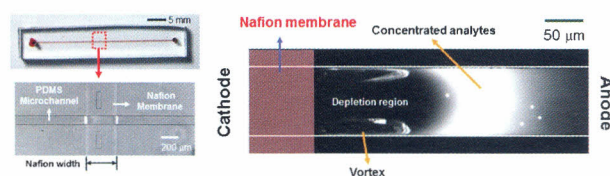


4472

Nanofluidic preconcentration device in a straight microchannel using ion concentration polarization

Sung Hee Ko, Yong-Ak Song, Sung Jae Kim, Myungji Kim, Jongyoon Han* and Kwan Hyoung Kang*

In this paper, we introduce a simple, straight microchannel design for a nanofluidic protein concentration device.

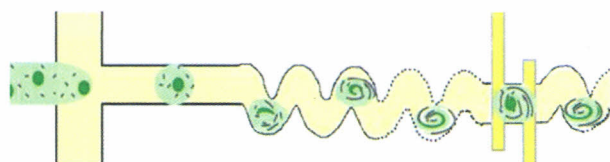


4483

Droplet electroporation in microfluidics for efficient cell transformation with or without cell wall removal

Baiyan Qu, Young-Jae Eu, Won-Joong Jeong and Dong-Pyo Kim*

An efficient cell transformation method is presented that utilizes droplet electroporation on a microfluidic chip.

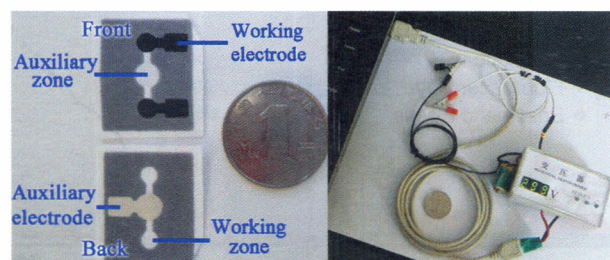


4489

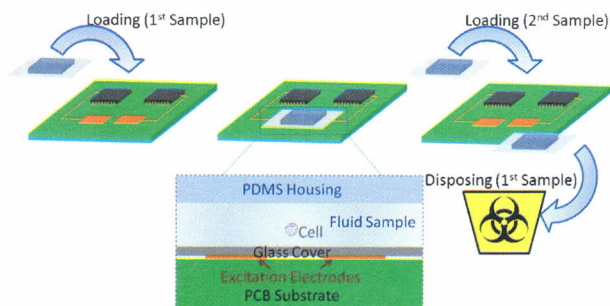
Battery-triggered microfluidic paper-based multiplex electrochemiluminescence immunodevice based on potential-resolution strategy

Shaowei Wang, Lei Ge, Yan Zhang, Xianrang Song, Nianqiang Li, Shenguang Ge and Jinghua Yu*

A battery-triggered microfluidic paper-based electrochemiluminescence (ECL) immunodevice was developed for the first time based on a novel potential-resolution strategy.



4499

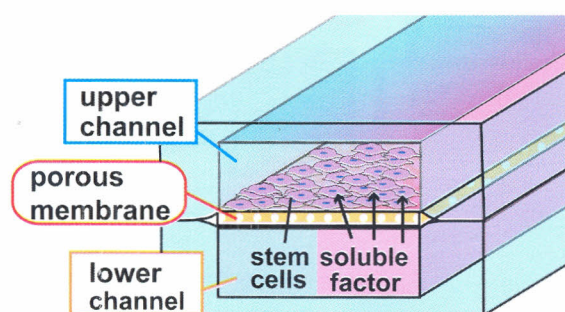


Microfluidic diagnostic tool for the developing world: contactless impedance flow cytometry

Sam Emaminejad,* Mehdi Javanmard, Robert W. Dutton and Ronald W. Davis

We report the use of contactless impedance measurement for significant reduction in cost of micro-fabricated cytometers.

4508

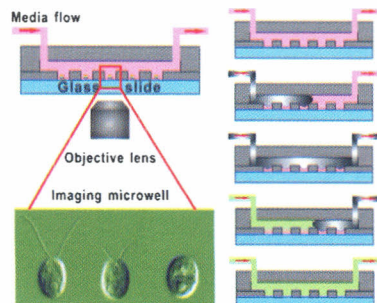


Spatiotemporally controlled delivery of soluble factors for stem cell differentiation

Jiro Kawada, Hiroshi Kimura, Hidenori Akutsu, Yasuyuki Sakai and Teruo Fujii*

Differentiation and cell fate decision of mouse induced pluripotent stem cells can be successfully controlled by the present method to form spatiotemporally non-uniform culture environments in a membrane-based microfluidic device.

4516

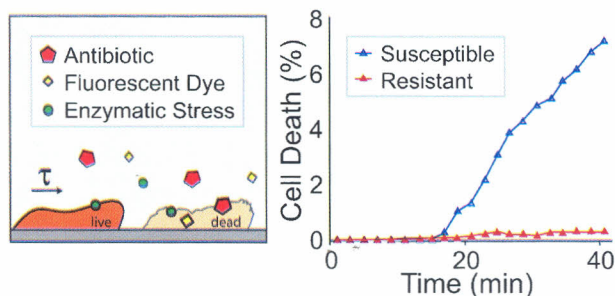


Controlling gas/liquid exchange using microfluidics for real-time monitoring of flagellar length in living *Chlamydomonas* at the single-cell level

Xiaoni Ai, Qionglin Liang,* Minna Luo, Kai Zhang, Junmin Pan* and Guoan Luo*

Real-time monitoring of flagellar length in single living cells of *Chlamydomonas* by using a PDMS/glass hybrid microfluidic device.

4523



A microfluidic platform for rapid, stress-induced antibiotic susceptibility testing of *Staphylococcus aureus*

Maxim Kalashnikov, Jean C. Lee, Jennifer Campbell, Andre Sharon and Alexis F. Sauer-Budge*

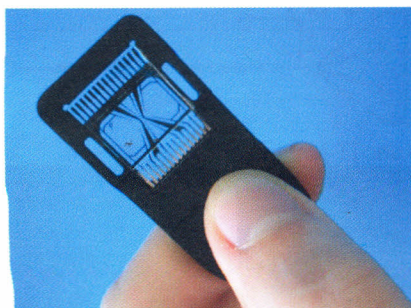
We present a microfluidic platform for rapid and phenotypic antibiotic susceptibility testing based on stress-activation of biosynthetic pathways that are primary targets of antibiotics.

4533

Label-free hybridoma cell culture quality control by a chip-based impedance flow cytometer

Arkadiusz Pierzchalski, Monika Hebeisen, Anja Mittag, Jozsef Bocsi, Marco Di Berardino and Attila Tarnok*

We present a novel application of a chip-based impedance flow cytometer (IFC) as a possible alternative to fluorescence-based methods for on-line quality monitoring of hybridoma cells.

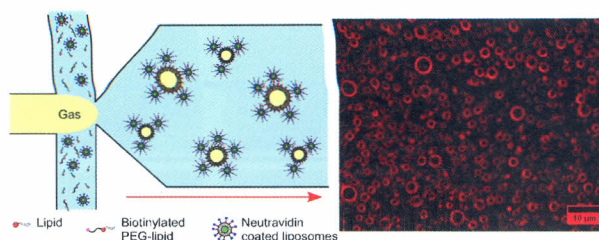


4544

Expanding 3D geometry for enhanced on-chip microbubble production and single step formation of liposome modified microbubbles

Sally A. Peyman, Radwa H. Abou-Saleh, James R. McLaughlan, Nicola Ingram, Benjamin R. G. Johnson, Kevin Critchley, Steven Freear, J. Anthony Evans, Alexander F. Markham, P. Louise Coletta and Stephen D. Evans*

We demonstrate a micro-spray formation regime for the fast production of high concentrations of therapeutic microbubbles.

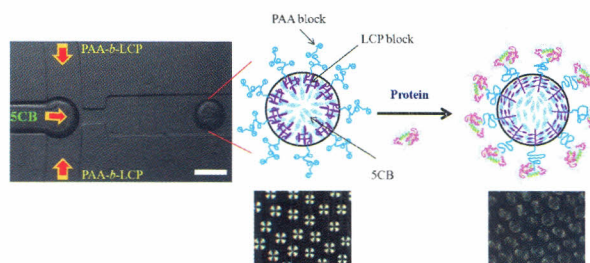


4553

Configuration change of liquid crystal microdroplets coated with a novel polyacrylic acid block liquid crystalline polymer by protein adsorption

Waliullah Khan and Soo-Young Park*

Protein adsorption is reported by a configurational change of LC_{PAA} droplets at pH regions where complexes between the PAA and proteins could be formed.

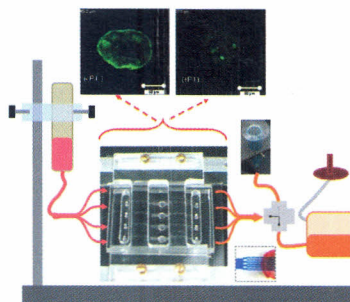


4560

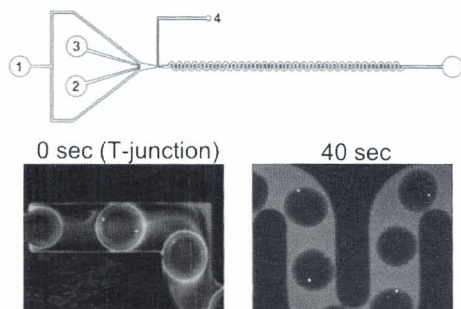
Thick-tissue bioreactor as a platform for long-term organotypic culture and drug delivery

Dmitry A. Markov, Jenny Q. Lu, Philip C. Samson, John P. Wikswo and Lisa J. McCawley*

Thick-Tissue Bioreactor system for long-term organotypic on-chip cultures and reagent delivery to tissue-like cell densities within low-volume microenvironment.



4569

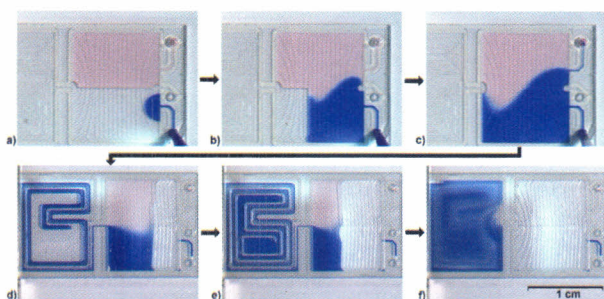


Enhanced fluorescence detection using liquid–liquid extraction in a microfluidic droplet system

Yan-Yu Chen, Zhao-Ming Chen and Hsiang-Yu Wang*

This study applied liquid–liquid extraction in a microfluidic droplet system to reduce the fluorescence background by 85% and increase the signal to noise ratio by up to 17 fold in the detection of microalgae cellular lipids.

4576



A phaseguided passive batch microfluidic mixing chamber for isothermal amplification

Sydney Hakenberg,* Matthias Hügler, Manfred Weidmann, Frank Hufert, Gregory Dame and Gerald A. Urban

Passive laminar flow mixing of two batches is integrated in a microfluidic chamber for isothermal nucleic acid detection.

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