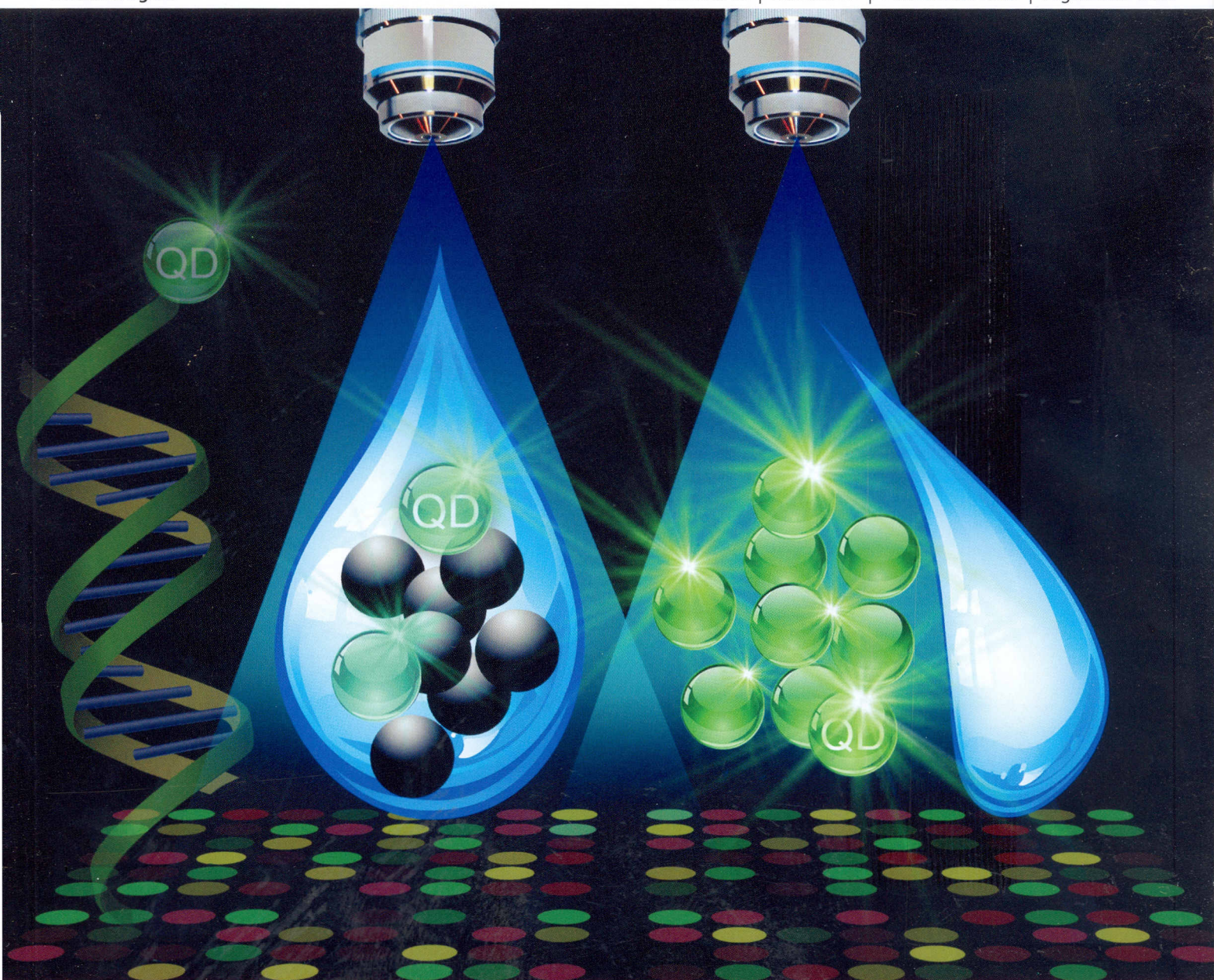


Lab on a Chip

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

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10th Anniversary: Focus on China

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COMMUNICATION

Gai *et al.*

Observing photophysical properties of quantum dots in air at the single molecule level: advantages in microarray applications

Celebrating
10
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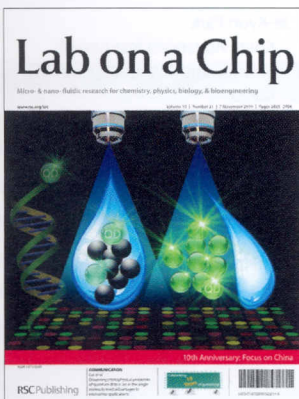
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See Gai *et al.*, pp. 2844–2847.
Quantum dots slow their photobleaching and blue shift when they are in air.
Image reproduced by permission of Hongwei Gai from *Lab Chip*, 2010, **10**, 2844.



Inside cover

See Yang *et al.*, pp. 2841–2843.
Thermo-responsive agarose enables highly efficient and massively parallel single molecule emulsion PCR: Sol for highly efficient PCR, Gel as capturing matrix to maintain monoclonality.
Image reproduced by permission of Chaoyong James Yang from *Lab Chip*, 2010, **10**, 2841.

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Research Highlights

Petra S. Dittrich*

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



THEMED ISSUE: 10TH ANNIVERSARY: FOCUS ON CHINA

EDITORIAL

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10th Anniversary Issue: China

From logic control of microfluidic droplets to microturbines—
Guest Editors Bingcheng Lin and Jianhua Qin highlight the contribution of Chinese research to micro and nanofluidics.



2838

Contributors to the 10th Anniversary China issue

Lab on a Chip profiles the contributors to the 10th Anniversary China issue.



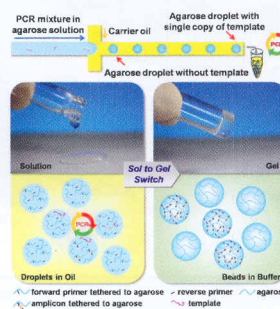
COMMUNICATIONS

2841

Agarose droplet microfluidics for highly parallel and efficient single molecule emulsion PCR

Xuefei Leng, Wenhua Zhang, Chunming Wang, Liang Cui and Chaoyong James Yang*

Droplet PCR with thermoresponsive agarose: sol for highly efficient PCR, gel as capturing matrix to maintain monoclonality.

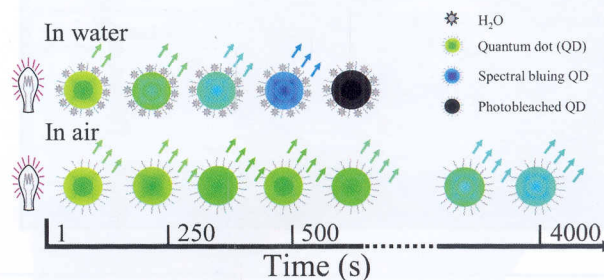


2844

Observing photophysical properties of quantum dots in air at the single molecule level: advantages in microarray applications

Xingbo Shi, Xianxin Meng, Lichun Sun, Jinhua Liu, Jing Zheng, Hongwei Gai,* Ronghua Yang and Edward S. Yeung

Photo characteristic differences of single quantum dot in solution with that in air are demonstrated. QDs in air show valuable photo properties such as antiphotobleaching, antioxidation and blinking suppression.



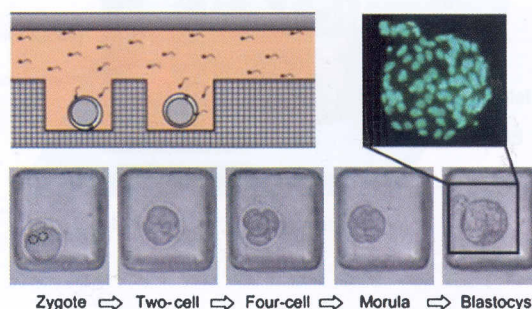
PAPERS

2848

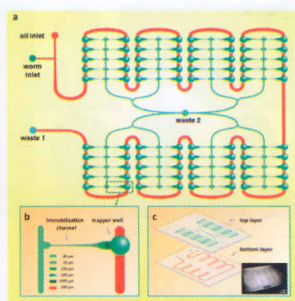
Integration of single oocyte trapping, *in vitro* fertilization and embryo culture in a microwell-structured microfluidic device

C. Han, Q. Zhang, R. Ma, L. Xie, T. Qiu, L. Wang, K. Mitchelson, J. Wang, G. Huang,* J. Qiao* and J. Cheng

We report a microwell array structured microfluidic device which integrates single murine oocyte trapping, *in vitro* fertilization, medium changing and subsequent embryo culture. The developmental status of each embryo can be individually tracked in this device.



2855

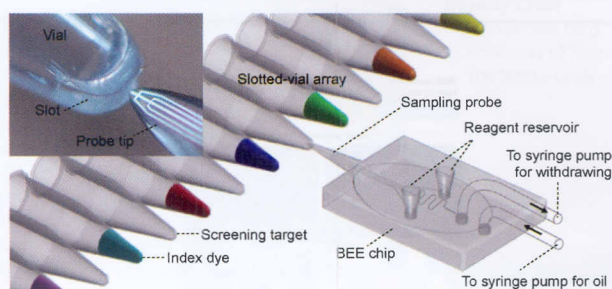


Droplet microfluidics for characterizing the neurotoxin-induced responses in individual *Caenorhabditis elegans*

Weiwei Shi, Hui Wen, Yao Lu, Yang Shi, Bingcheng Lin* and Jianhua Qin*

A novel floatage-based droplet microfluidic device is described for characterizing the neurotoxin-induced multiple responses in individual *Caenorhabditis elegans* continuously.

2864

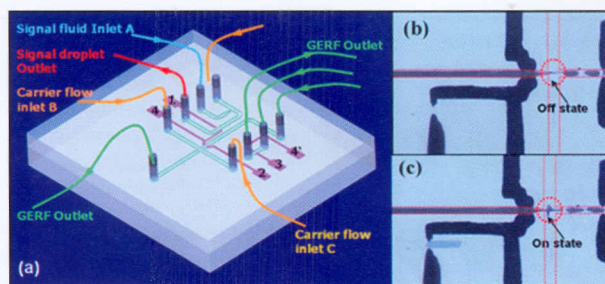


High-throughput sample introduction for droplet-based screening with an on-chip integrated sampling probe and slotted-vial array

Meng Sun and Qun Fang*

We developed a droplet-based microfluidic screening system with ultra-high sampling throughput up to 6000 h^{-1} based on an on-chip sampling probe integrating multi-channels for sample introduction, reagent merging and nanolitre-scale droplet generation, and a slotted-vial array sample presenting system.

2869

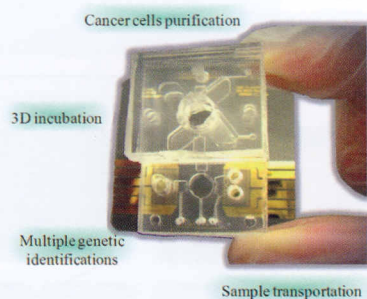


Logic control of microfluidics with smart colloid

Limu Wang, Mengying Zhang, Jiaxing Li, Xiuqing Gong and Weijia Wen*

A novel method to realize pure microfluid logic by using a giant electrorheological fluid as working medium.

2875



Rapid isolation and detection of cancer cells by utilizing integrated microfluidic systems

Kang-Yi Lien, Ying-Hsin Chuang, Lein-Yu Hung, Keng-Fu Hsu, Wu-Wei Lai, Chung-Liang Ho, Cheng-Yang Chou and Gwo-Bin Lee*

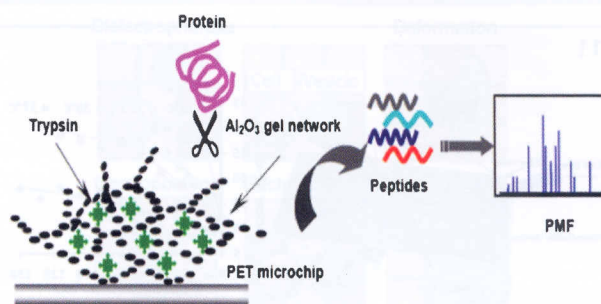
The present study reports a new three-dimensional (3D) microfluidic platform capable of rapid isolation and detection of cancer cells from a large sample volume (e.g. $\sim 1 \text{ mL}$) by utilizing magnetic microbead-based technologies.

2887

Improvement of proteolytic efficiency towards low-level proteins by an antifouling surface of alumina gel in a microchannel

Yun Liu, Huixiang Wang, Qingping Liu, Haiyun Qu, Baohong Liu and Pengyuan Yang*

An antifouling alumina gel-derived microchip has been developed for highly efficient proteolysis towards low-level proteins and real samples.

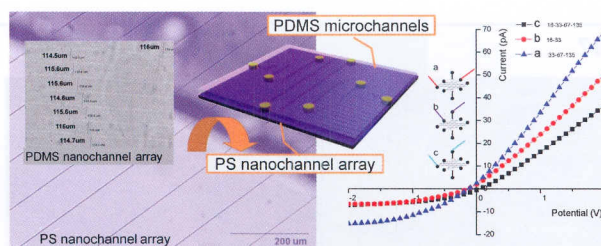


2894

Large scale lithography-free nano channel array on polystyrene

Bi-Yi Xu, Jing-Juan Xu,* Xing-Hua Xia and Hong-Yuan Chen

Nanochannel arrays were successfully grown on PS surface, which are applicable for ionic current rectification when combined with microfluidic structures.



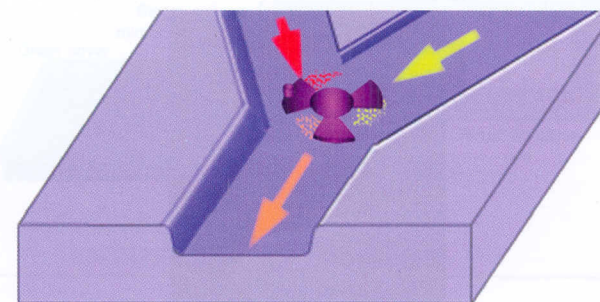
TECHNICAL NOTES

2902

High performance magnetically controllable microturbines

Ye Tian, Yong-Lai Zhang,* Jin-Feng Ku, Yan He, Bin-Bin Xu, Qi-Dai Chen, Hong Xia and Hong-Bo Sun*

High performance magnetically controllable microturbines with improved surface smoothness are successfully fabricated through two-photon photopolymerization of Fe_3O_4 nanoparticles doped photoresists towards microchannel functionalization.

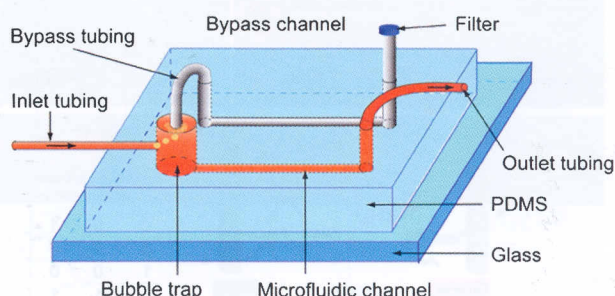


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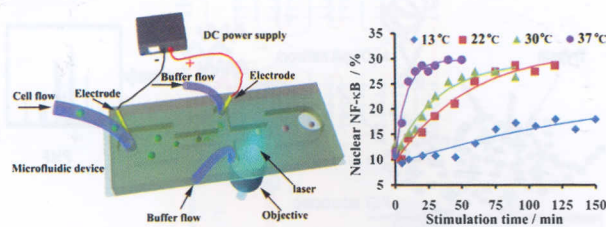
A simple PDMS-based microfluidic channel design that removes bubbles for long-term on-chip culture of mammalian cells

Wenfu Zheng, Zhuo Wang, Wei Zhang* and Xingyu Jiang*

We report two kinds of integrated bubble trap (IBT) which have excellent properties, including simplicity in structure, ease in fabrication, no interference with flow system, and excellent stability. IBT-B allows bubble-free cell culture over 10 days.



2911

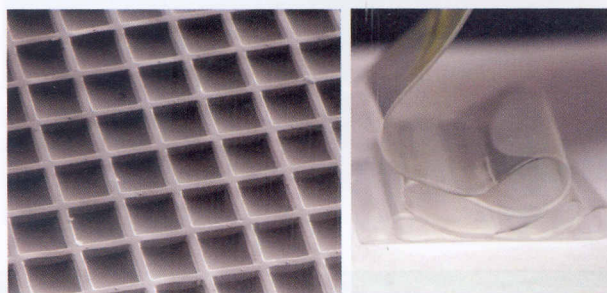


Kinetics of NF- κ B nucleocytoplasmic transport probed by single-cell screening without imaging

Jun Wang, Bei Fei, Yihong Zhan, Robert L. Geahlen and Chang Lu*

Microfluidic electroporative flow cytometry is used to study kinetics of nucleocytoplasmic transport of an important transcription factor NF- κ B.

2917

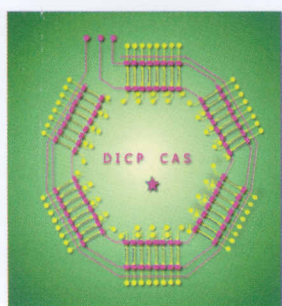


Micromolded arrays for separation of adherent cells

Yuli Wang, Colleen Phillips, Wei Xu, Jeng-Hao Pai, Rahul Dhopeswarkar, Christopher E. Sims and Nancy Allbritton*

A micromolded array provides a flexible platform for capture and separation of living cells in biological applications.

2925

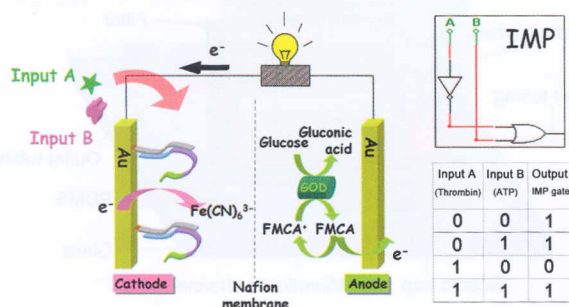


Microvalve and micropump controlled shuttle flow microfluidic device for rapid DNA hybridization

Shuqiang Huang, Chunyu Li, Bingcheng Lin* and Jianhua Qin*

A novel microfluidic device integrated with microvalves and micropumps is presented for rapid DNA hybridization using shuttle flow.

2932



An IMP-Reset gate-based reusable and self-powered "smart" logic aptasensor on a microfluidic biofuel cell

Ming Zhou, Chaogui Chen, Yan Du, Bingling Li, Dan Wen, Shaojun Dong* and Erkang Wang*

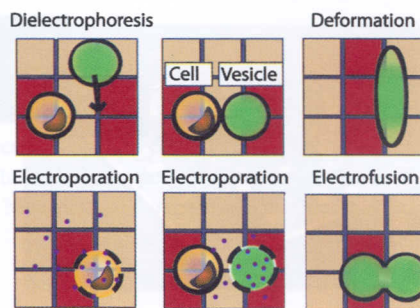
By combining the adaptive behavior of microfluidic biofuel cells (BFCs) self-regulating the power release with aptamer IMP logic, we constructed a novel IMP-Reset gate-based reusable and self-powered on-chip aptasensor, which can be used to logically determine the presence of one specific target in the absence of another target in complex physiological samples (such as human serum) in a single test.

2937

A microfluidic microprocessor: controlling biomimetic containers and cells using hybrid integrated circuit/microfluidic chips

David Issadore, Thomas Franke, Keith A. Brown and Robert M. Westervelt*

We present a hybrid integrated circuit/microfluidic chip that simultaneously controls thousands of living cells and pL volumes of fluid contained in phospholipid bilayer vesicles, enabling a wide range of research and medical applications.

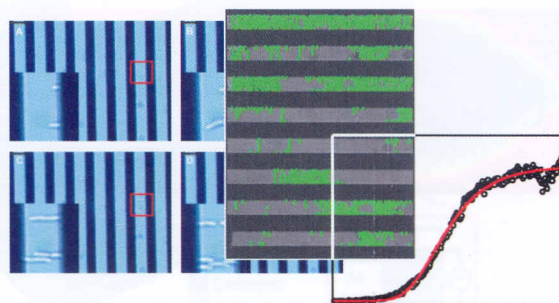


2944

Single-cell bacteria growth monitoring by automated DEP-facilitated image analysis

Ingmar Peitz* and Rien van Leeuwen

A novel method to measure bacteria growth curves was used for rapid antibiotic susceptibility testing, exploiting the dielectrophoretic properties of *Escherichia coli* in automated time-resolved image analysis.

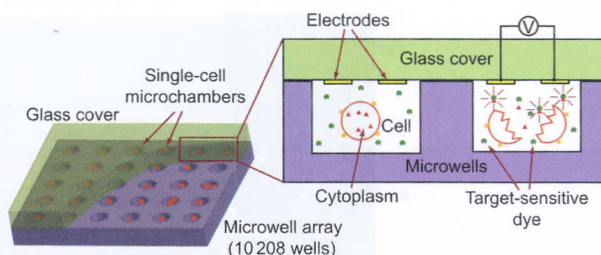


2952

Large-scale arrays of picolitre chambers for single-cell analysis of large cell populations

Won Chul Lee, Sara Rigante, Albert P. Pisano* and Frans A. Kuypers*

We present a large-scale array of microchambers where individual cells are collected, enclosed, and lysed for the cytoplasmic analysis.

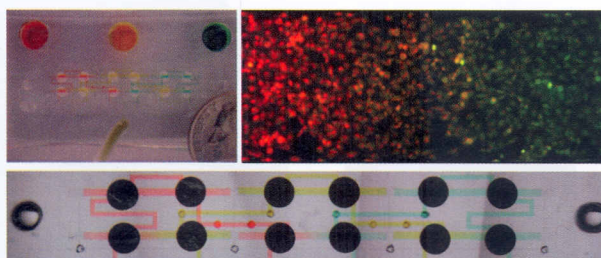


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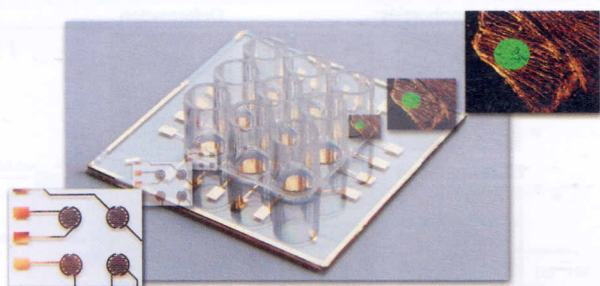
Uniform cell seeding and generation of overlapping gradient profiles in a multiplexed microchamber device with normally-closed valves

Bobak Mosadegh, Mayank Agarwal, Hossein Tavana, Tommaso Bersano-Begey, Yu-suke Torisawa, Maria Morell, Matthew J. Wyatt, K. Sue O'Shea, Kate F. Barald and Shuichi Takayama*

We describe a microdevice that simultaneously generates several gradient conditions in flow-free microchambers separated by normally-closed valves that enable efficient cell seeding.



2965

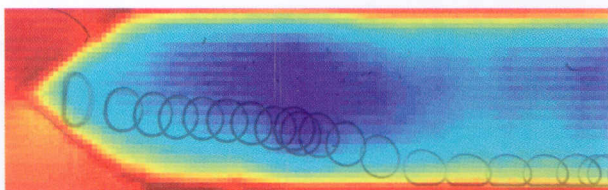


Real-time monitoring of relaxation and contractility of smooth muscle cells on a novel biohybrid chip

Sina Haas, Heinz-Georg Jahnke, Marco Glass, Ronny Azendorf, Sabine Schmidt and Andrea A. Robitzki*

A novel biohybrid multiwell sensor-array optimized for the impedance based real-time monitoring of smooth muscle cell contractility.

2972

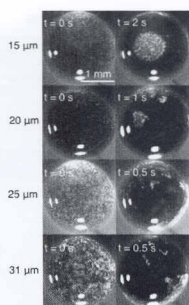


Microchannel deformations due to solvent-induced PDMS swelling

Rémi Dangla, François Gallaire and Charles N. Baroud*

We demonstrate a precise method to measure small changes in microchannel height using a simple optical setup. Swelling oils are found to deform the channel roof by a few microns, sufficient for modifying the trajectories of water droplets flowing within them.

2979

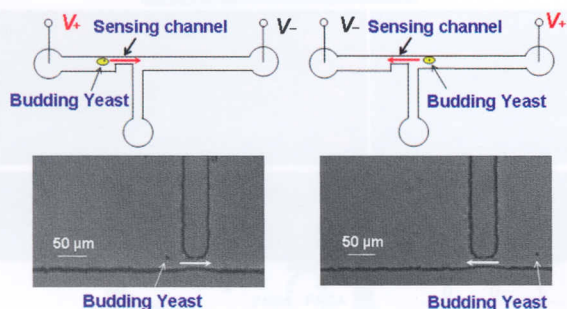


Exploitation of surface acoustic waves to drive size-dependent microparticle concentration within a droplet

Priscilla R. Rogers, James R. Friend and Leslie Y. Yeo*

Ultrafast microcentrifugation driven by surface acoustic waves can be used to discriminate and hence partition microparticles in a droplet based on their size due to the specific scaling of the drag and acoustic force on the particle with respect to the particle dimension.

2986



Measurement of the volume growth rate of single budding yeast with the MOSFET-based microfluidic Coulter counter

Jiashu Sun, Chris C. Stowers, Erik M. Boczek and Deyu Li*

Schematic diagrams and microscopic images of a single yeast cell moved back and forth through the sensing channel by switching the applied electrical voltage. Using the MOSFET-based resistive-pulse sensing scheme, the volume growth rate of single yeast cells can be measured.