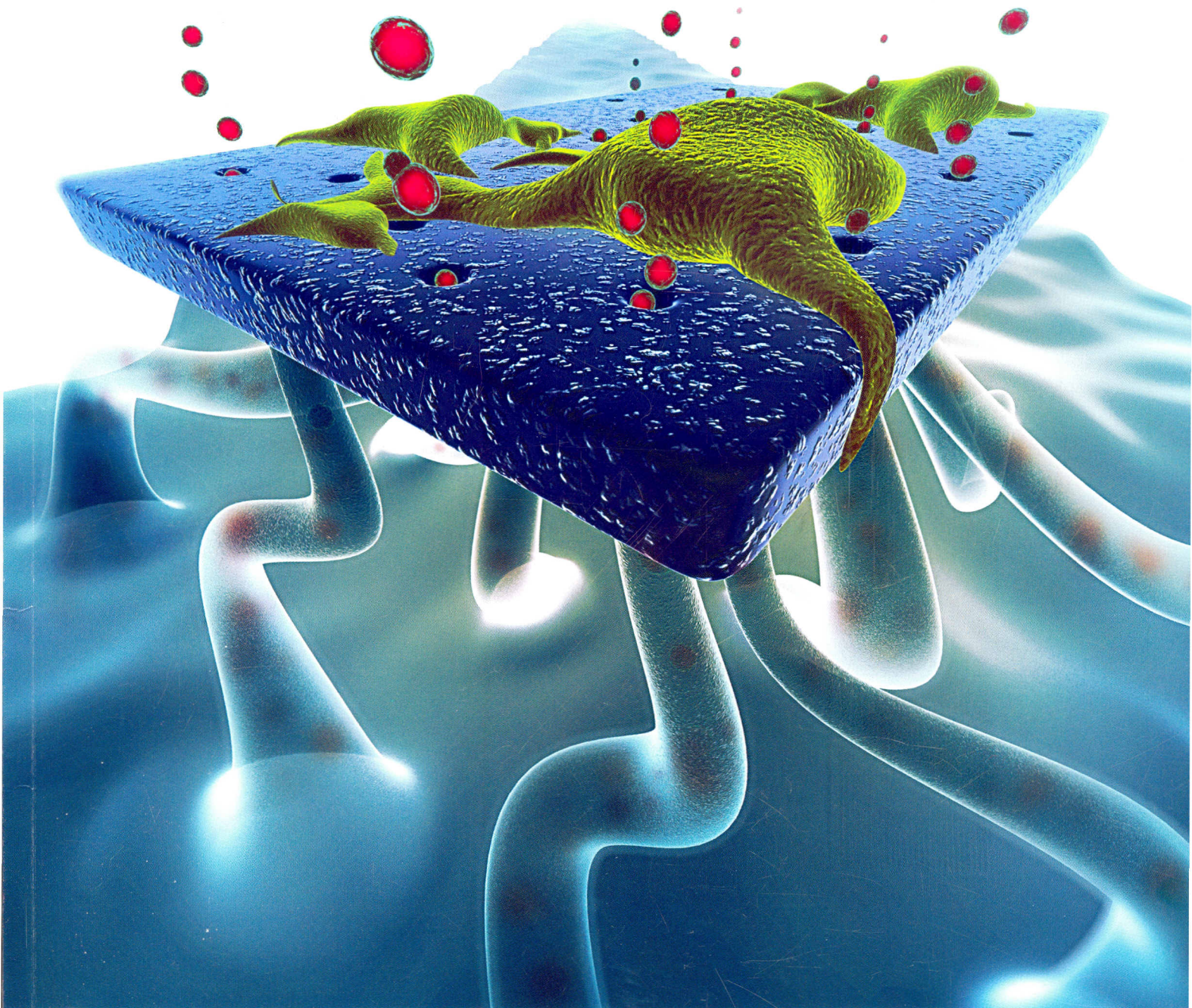


Lab on a Chip

Miniaturisation for chemistry, physics, biology and bioengineering

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PAPER

Nicholas A. Melosh *et al.*

Rapid spatial and temporal controlled signal delivery over large cell culture areas



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Lab on a Chip

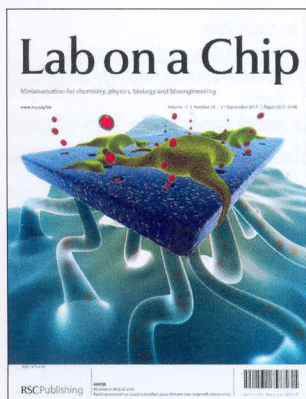
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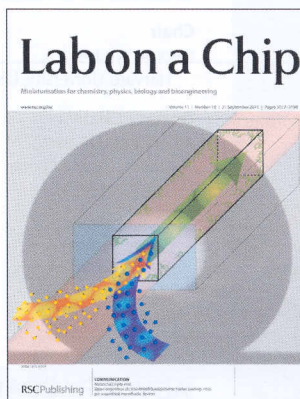
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Cover
See Nicholas A. Melosh *et al.*, pp. 3057–3063.
Image reproduced by permission of Nicholas A. Melosh from *Lab Chip*, 2011, **11**, 3057.



Inside cover
See Malancha Gupta *et al.*, pp. 3049–3052.
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HIGHLIGHT

3029

Research highlights

Šeila Selimović and Ali Khademhosseini*

Šeila Selimović and Ali Khademhosseini review the current literature in miniaturisation and related technologies.



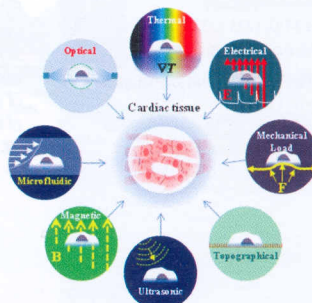
CRITICAL REVIEW

3031

Engineered approaches to the stem cell microenvironment for cardiac tissue regeneration

Ebrahim Ghafar-Zadeh, John R. Waldeisen and Luke P. Lee*

In vitro stem cell stimulation methods (*e.g.* mechanical, electrical, and topographical) can enhance our understanding of the mechanisms involved within stem cell niches and provide alternative means for directing cardiac tissue regeneration.

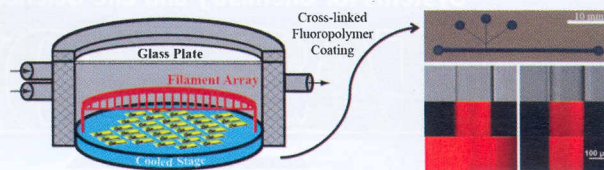


3049

Vapor deposition of cross-linked fluoropolymer barrier coatings onto pre-assembled microfluidic devices

Carson T. Riche, Brandon C. Marin, Noah Malmstadt* and Malancha Gupta*

The interior surfaces of pre-assembled poly(dimethylsiloxane) (PDMS) microfluidic devices were modified with a cross-linked fluoropolymer barrier coating that significantly increased the chemical compatibility of the devices.

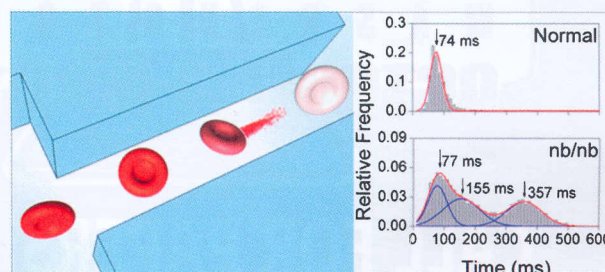


3053

Single-cell electrical lysis of erythrocytes detects deficiencies in the cytoskeletal protein network

Ning Bao, Gayani C. Kodippili, Katie M. Giger, Velia M. Fowler, Philip S. Low* and Chang Lu*

The histogram of the electrical lysis time for a red blood cell population is characteristic of its cytoskeletal protein deficiency.



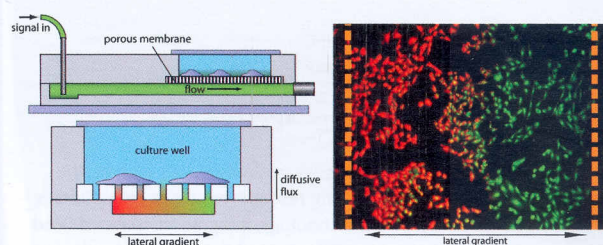
PAPERS

3057

Rapid spatial and temporal controlled signal delivery over large cell culture areas

Jules J. VanDersarl, Alexander M. Xu and Nicholas A. Melosh*

A new cell culture device that allows for rapid chemical delivery over large areas without fluid flow over the cells.

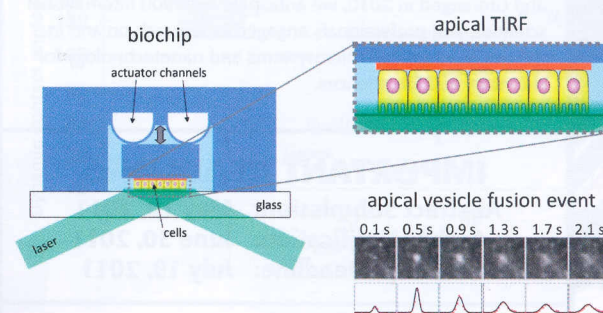


3064

A PDMS-based biochip with integrated sub-micrometre position control for TIRF microscopy of the apical cell membrane

Roland Thuenauer,* Kata Juhasz, Reinhard Mayr, Thomas Frühwirth, Anna-Maria Lipp, Zsolt Balogi and Alois Sonnleitner*

A positioning system was integrated in a PDMS-based biochip, providing an all-in-one solution for TIRF microscopy of the apical cell membrane and enabling imaging of apical vesicle fusion events.

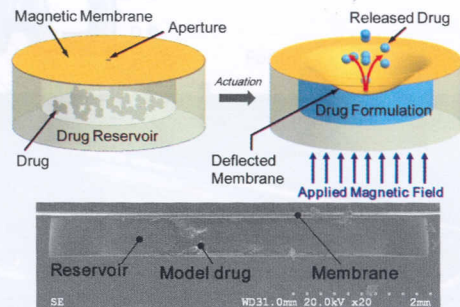


3072

A magnetically controlled MEMS device for drug delivery: design, fabrication, and testing

Fatemeh Nazly Pirmoradi, John K. Jackson, Helen M. Burt and Mu Chiao*

We report the development of an all polymer battery-less device for on-demand and controlled drug delivery.

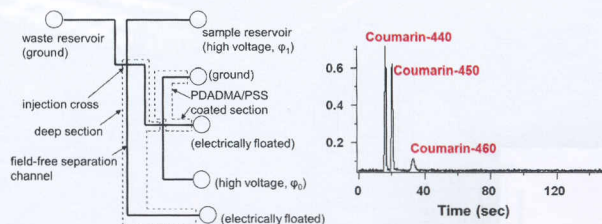


3081

A microfluidic device for performing pressure-driven separations

Debashis Dutta and J. Michael Ramsey*

A microfluidics based liquid chromatographic system with on-chip pressure generation and sample injection capabilities.

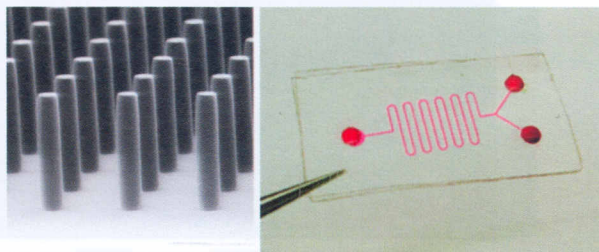


3089

Benchtop micromolding of polystyrene by soft lithography

Yuli Wang, Joseph Balowski, Colleen Phillips, Ryan Phillips, Christopher E. Sims and Nancy L. Allbritton*

Microdevices composed of polystyrene can be prototyped easily and inexpensively for a variety of applications by a benchtop micromolding process.

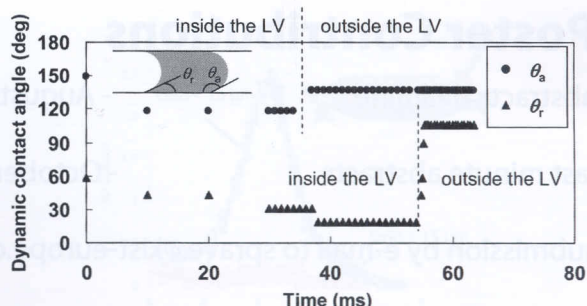


3098

Experimental investigation of droplet acceleration and collision in the gas phase in a microchannel

Katsuyoshi Takahashi, Yasuhiko Sugii, Kazuma Mawatari and Takehiko Kitamori*

We developed a novel microfluidic system, termed a micro-droplet collider, by utilizing the spatial-temporal localized liquid energy to realize chemical processes, which achieved rapid mixing between droplets having a large volume ratio by collision.

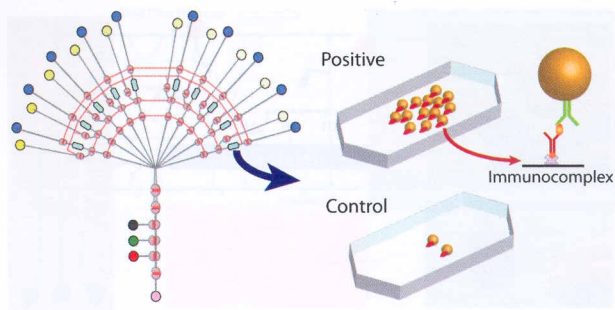


3106

Integrated microfluidic bioprocessor for solid phase capture immunoassays

Jungkyu Kim, Erik C. Jensen, Mischa Megens, Bernhard Boser and Richard A. Mathies*

A programmable microfluidic device with automated sample delivery, hydrodynamic washing and substrate compatibility is developed for solid-phase immunoassays based on microparticle labeling.

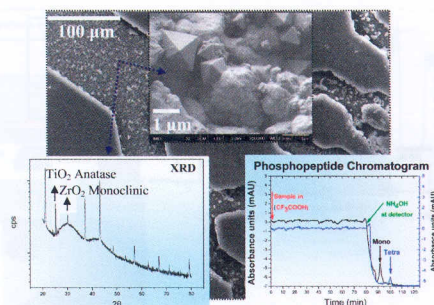


3113

TiO₂-ZrO₂ affinity chromatography polymeric microchip for phosphopeptide enrichment and separation

Katerina Tsougeni, Panagiotis Zerefos, Angeliki Tserepi, Antonia Vlahou, Spiros D. Garbis and Evangelos Gogolides*

We demonstrate enrichment and separation of (a) a standard mono- and tetra-phosphopeptide, and (b) phosphopeptides contained in a tryptic digest of β -Casein. The chip had a capacity of $>1.4 \mu\text{g}$ (0.7 nmol) and a recovery of $94 \pm 3\%$, and can be reproducibly used several times.

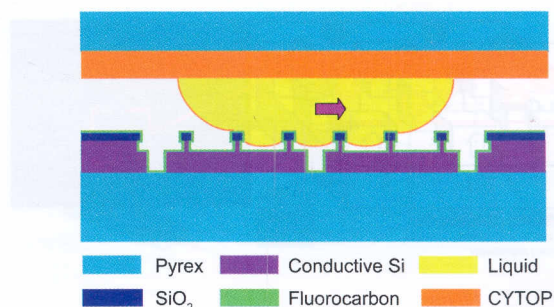


3121

Engineering superlyophobic surfaces as the microfluidic platform for droplet manipulation

Tianzhun Wu* and Yuji Suzuki

Microfabricated engineering superlyophobic surfaces (SLS), which exhibit extremely high contact angle, good pressure, low adhesion and flow friction, are proposed as the universal microfluidic platform for droplet manipulation applicable for various liquids. When a hexadecane droplet is moved manually between a smooth Teflon-like surface (CYTOP) and the SLS, its adhesion and flow resistance on SLS are reduced by 98% and 73% respectively compared with the smooth surface.

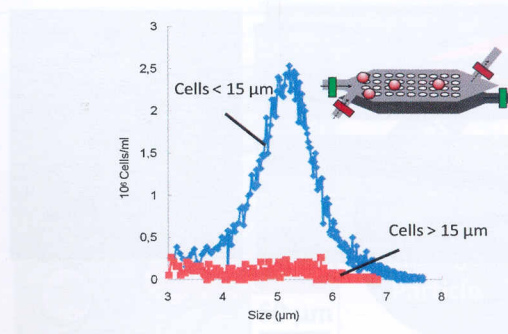


3130

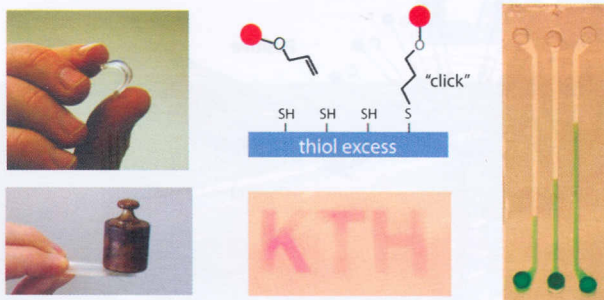
Microfluidic purification and analysis of hematopoietic stem cells from bone marrow

Romana Schirhagl, Ingo Fuereder, Eric W. Hall, Bruno C. Medeiros and Richard N. Zare*

We present a filter-based microfluidic chip that is able to separate by size hematopoietic stem cells present in bone marrow samples.



3136

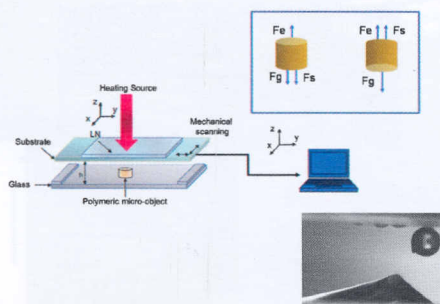


Beyond PDMS: off-stoichiometry thiol-ene (OSTE) based soft lithography for rapid prototyping of microfluidic devices

Carl Fredrik Carlborg,* Tommy Haraldsson, Kim Öberg, Michael Malkoch and Wouter van der Wijngaart

We introduce a novel polymer platform called off-stoichiometry thiol-enes (OSTEs), aiming to bridge the gap between research prototyping and commercial production of microfluidic devices.

3148

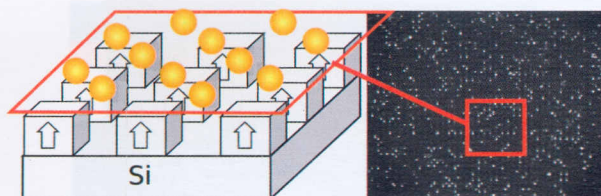


Pyroelectric Adaptive Nanodispenser (PYRANA) microrobot for liquid delivery on a target

Veronica Vespini,* Sara Coppola, Simonetta Grilli, Melania Paturzo and Pietro Ferraro

The electrode-less technique is useful to grip and transport micro-objects driven by a pyroelectrically generated electric field.

3153

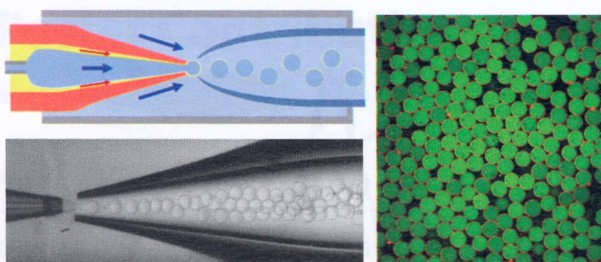


Diamagnetically trapped arrays of living cells above micromagnets

Paul Kauffmann,* Ammara Ith, Daniel O'Brien, Victor Gaude, Florian Boué, Stéphanie Combe, Franz Bruckert, Béatrice Schaack, Nora M. Dempsey, Vincent Haguët and Gilbert Reyne

Contactless label-free diamagnetic arraying of cells in suspension is performed using microfabricated permanent magnets and low-concentration contrast agent.

3162



Double-emulsion drops with ultra-thin shells for capsule templates

Shin-Hyun Kim, Jin Woong Kim, Jun-Cheol Cho and David A. Weitz*

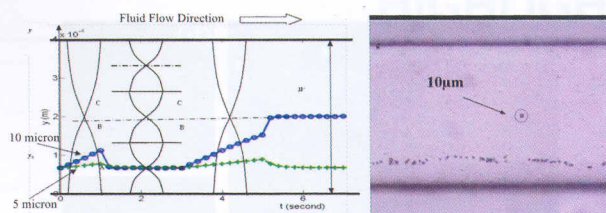
A one-step emulsification process using a biphasic flow enables the production of monodisperse double-emulsion drops with an ultra-thin middle layer.

3167

Particle separation in microfluidics using a switching ultrasonic field

Yang Liu and Kian-Meng Lim*

Using an ultrasonic field, switching between the first and third resonant modes, micro-sized particles of different sizes are separated onto two modal lines in the fluid channel.

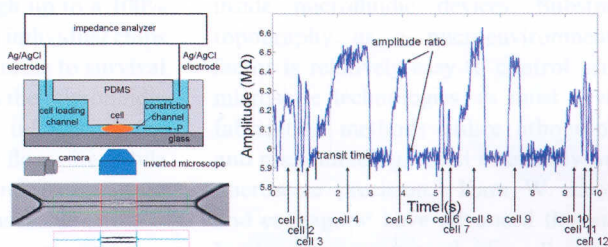


3174

Classification of cell types using a microfluidic device for mechanical and electrical measurement on single cells

Jian Chen, Yi Zheng, Qingyuan Tan, Ehsan Shojaei-Baghini, Yan Liang Zhang, Jason Li, Preethy Prasad, Lidan You, Xiao Yu Wu and Yu Sun*

This paper presents a microfluidic system that measures both electrical and mechanical parameters on single cells to classify cell types biophysically.

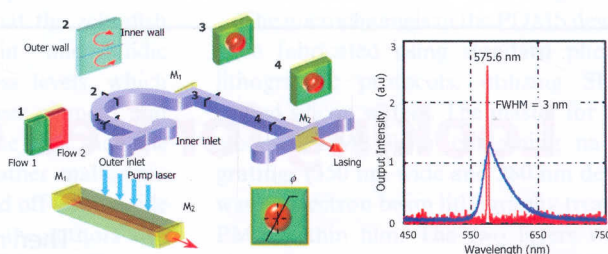


3182

A tunable 3D optofluidic waveguide dye laser via two centrifugal Dean flow streams

Y. Yang, A. Q. Liu,* L. Lei, L. K. Chin, C. D. Ohl, Q. J. Wang and H. S. Yoon

A tunable 3D optofluidic waveguide dye laser utilizing two centrifugal Dean flow streams was demonstrated with the emission spectrum.



TECHNICAL NOTES

3188

Double emulsions with controlled morphology by microgel scaffolding

Julian Thiele* and Sebastian Seiffert

Double emulsions with arrested morphology are formed in PDMS microfluidic devices. Control is exercised by encapsulating monodisperse microgel particles into the double emulsion shell. As a result, the position of the inner drop is determined by the size and packing of these particles.

