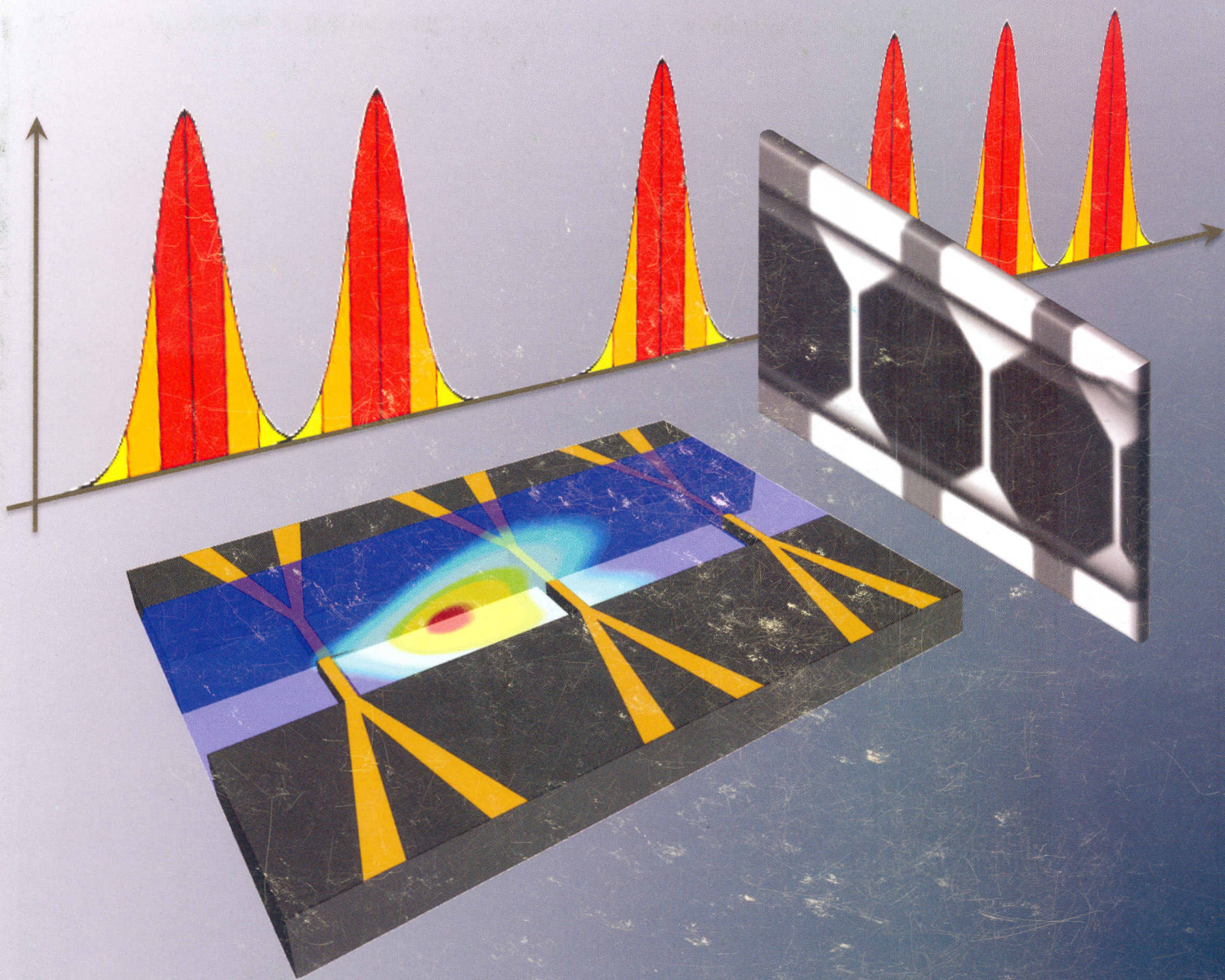


Lab on a Chip

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

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PAPER

Berthet *et al.*
Time-of-flight thermal flowrate sensor
for lab-on-chip applications



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See Berthet *et al.*, pp. 215–223. Image reproduced by permission of Helene Berthet from *Lab Chip*, 2011, **11**, 215.



Inside cover

See Zhao *et al.*, pp. 224–230. Image reproduced by permission of Tingrui Pan from *Lab Chip*, 2011, **11**, 224.

EDITORIAL

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What Comes Next?

George M. Whitesides

George Whitesides, chair of the *Lab on a Chip* Editorial Board, discusses potential future opportunities for lab on a chip and microfluidic technologies.



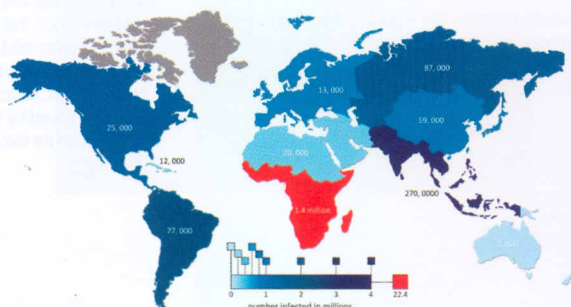
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Tackling HIV through robust diagnostics in the developing world: current status and future opportunities

Darash Desai, Grace Wu and Muhammad H. Zaman*

We review the current technological tools for HIV diagnostics, current research for point-of-care diagnostics in low-resource settings, as well as important social and political factors that influence the use of these devices in the developing world.

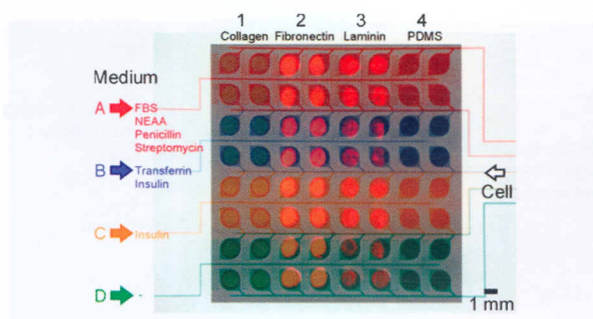


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Microenvironment array chip for cell culture environment screening

Koji Hattori, Shinji Sugiura* and Toshiyuki Kanamori

Microchamber array with 16 different cell culture environments composed of a combination of four soluble factors and four extracellular matrices.



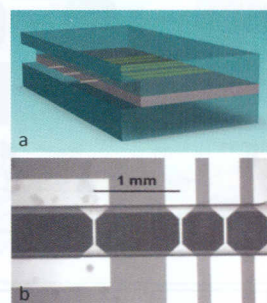
PAPERS

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Time-of-flight thermal flowrate sensor for lab-on-chip applications

Helene Berthet,* Jacques Jundt, Jerome Durivault, Bruno Mercier and Dan Angelescu

We describe a novel thermal microflowrate sensor for measuring liquid flow velocity in microfluidic channels, which is capable of providing a highly accurate linear response largely independent of the thermal and physical properties of the working liquid.

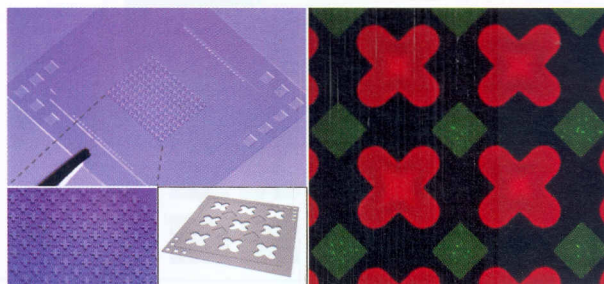


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Stereomask lithography (SML): a universal multi-object micro-patterning technique for biological applications

Siwei Zhao, Arnold Chen, Alexander Revzin and Tingrui Pan*

We present stereomask lithography (SML) for universal multi-object biological micropatterning based on serial placement of multiple objects using a novel 3D protective shadow mask and a peg-in-hole interlayer alignment scheme.

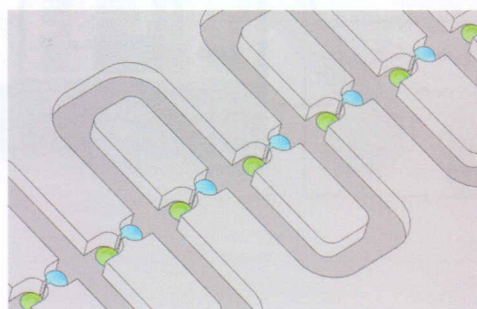


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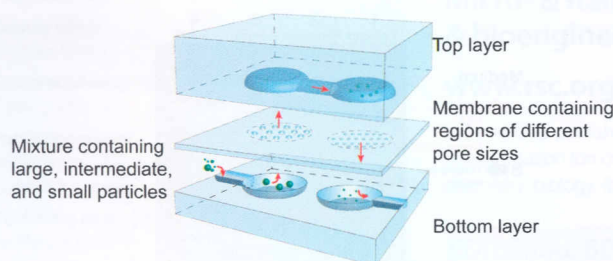
A microfluidic array with cellular valving for single cell co-culture

Jean-Philippe Frimat, Marco Becker, Ya-Yu Chiang, Ulrich Marggraf, Dirk Janasek, Jan G. Hengstler, Joachim Franzke and Jonathan West*

A cellular valving concept was used in combination with a differential resistance microfluidic circuit for efficient single cell co-culture.



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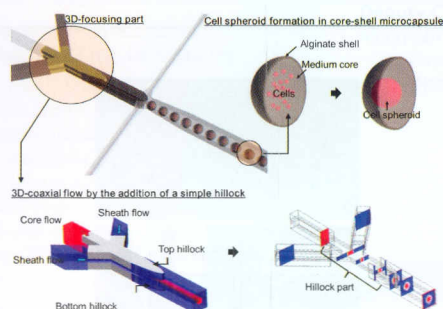


Particle sorting using a porous membrane in a microfluidic device

Huibin Wei, Bor-han Chueh, Huiling Wu, Eric W. Hall, Cheuk-wing Li, Romana Schirhagl, Jin-Ming Lin* and Richard N. Zare*

A filter containing one or more membranes, each having regions of different pore sizes, has been integrated into a microfluidic chip as a particle separator allowing almost 100% sorting efficiency.

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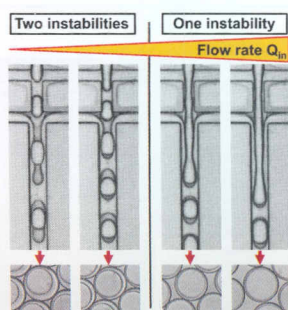


Generation of core-shell microcapsules with three-dimensional focusing device for efficient formation of cell spheroid

Choong Kim, Seok Chung, Young Eun Kim, Kang Sun Lee, Soo Hyun Lee, Kwang Wook Oh and Ji Yoon Kang*

We presented a hillock structure in microchannel that can produce perfect 3D coaxial flow to generate hollow alginate microcapsule. This technology enabled us to encapsulate mouse embryonic carcinoma cells in the core-shell microcapsule and it was demonstrated that it could form massive and uniform-sized EBs (embryonic bodies) effectively.

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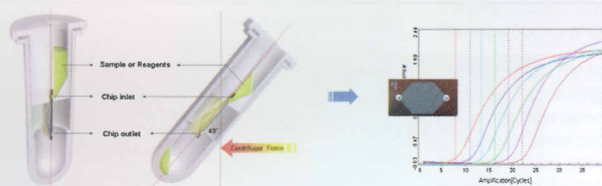


One-step formation of multiple emulsions in microfluidics

Adam R. Abate, Julian Thiele and David A. Weitz*

We present the formation of multiple emulsions with controllable shell thicknesses in microfluidic devices. By controlling dripping instabilities, the emulsions are either formed in a two-step or in a one-step process.

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Functional integration of DNA purification and concentration into a real time micro-PCR chip

Junhong Min, Joon-Ho Kim, Youngsun Lee, Kak Namkoong, Hae-Cheon Im, Han-Nah Kim, Hae-Yeong Kim, Nam Huh* and Young-Rok Kim*

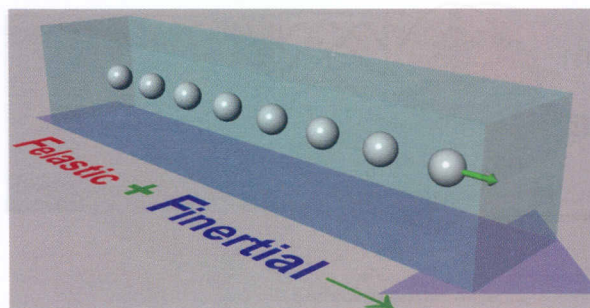
We present a PCR-based molecular diagnostic device comprised of a microfabricated chip and centrifugal force assisted liquid handling tube that is designed to carry out concentration and purification of DNA and subsequent amplification of the target gene in a single chip.

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Sheathless elasto-inertial particle focusing and continuous separation in a straight rectangular microchannel

Seungyoung Yang, Jae Young Kim, Seong Jae Lee, Sung Sik Lee* and Ju Min Kim*

A novel method for sheathless particle focusing in a straight microchannel, called “Elasto-Inertial Particle Focusing”, is presented in this work. Without any additional external force or apparatus, the particles are notably aligned along the centerline of a straight channel under a pressure-driven flow through the addition of an elasticity enhancer.

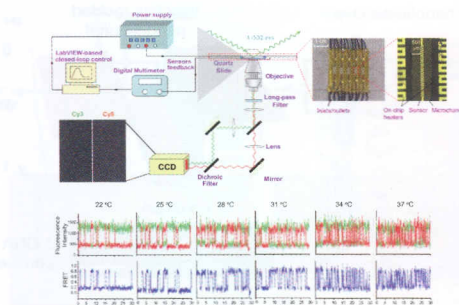


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A microfluidic approach for investigating the temperature dependence of biomolecular activity with single-molecule resolution

Bin Wang, Joseph Ho, Jingyi Fei, Ruben L. Gonzalez Jr. and Qiao Lin*

An integrated microfluidic platform for temperature-dependent single-molecule investigations enables the study of the temperature-dependence of transition rates associated with the pre-translocation ribosomal complex at physiological temperatures.

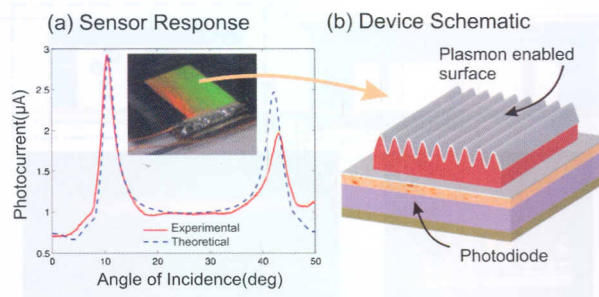


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Grating coupler integrated photodiodes for plasmon resonance based sensing

Burak Turker,* Hasan Guner,* Sencer Ayas, Okan O. Ekiz, Handan Acar, Mustafa O. Guler and Aykutlu Dâna

We demonstrate a sensitive and easy-to-fabricate plasmon resonance sensor by integrating a grating coupler with a photodiode.

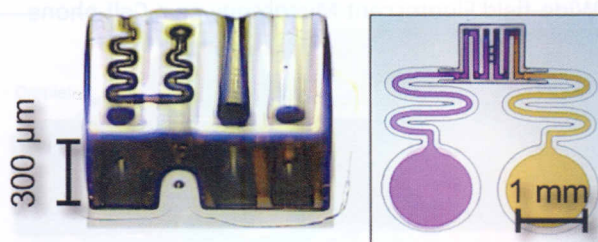


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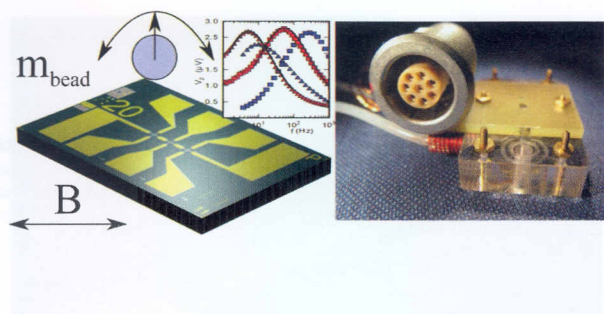
Fabrication of monolithic 3D micro-systems

Pakorn Preechaburana and Daniel Filippini*

This article describes a method and platform for fast prototyping of monolithic 3D microstructures, capable of producing arbitrary positive, negative and suspended 3D geometries, as well as sealed spaces and aligned 3D geometries using standard photoresists and few fabrication steps.



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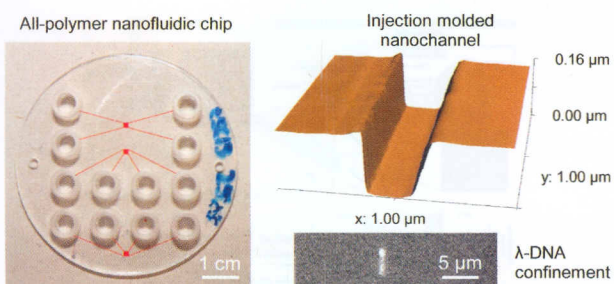


Bead magnetorelaxometry with an on-chip magnetoresistive sensor

Bjarke Thomas Dalslet,^{*} Christian Danvad Damsgaard, Marco Donolato, Maria Strømme, Mattias Strömberg, Peter Svedlindh and Mikkel Fougt Hansen

Brownian relaxation spectra of magnetic beads for biosensing is measured using an on-chip planar Hall effect sensor in a microfluidic system and compared to spectra obtained by conventional SQUID magnetorelaxometry.

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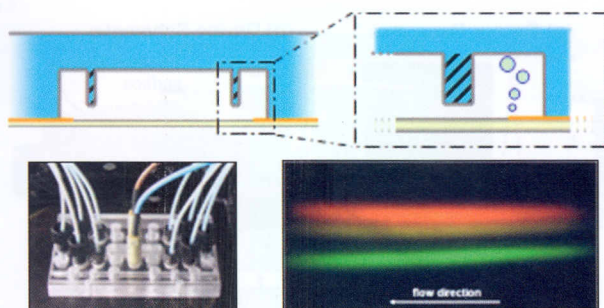


Injection molded nanofluidic chips: Fabrication method and functional tests using single-molecule DNA experiments

Pawel Utko,^{*} Fredrik Persson, Anders Kristensen and Niels B. Larsen

We demonstrate that fabrication of nanofluidic systems can be greatly simplified by injection molding of polymers. We functionally test our devices by single-molecule DNA experiments in nanochannels.

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PDMS free-flow electrophoresis chips with integrated partitioning bars for bubble segregation

Stefan Köhler, Claudia Weilbeer, Steffen Howitz, Holger Becker, Volker Beushausen and Detlev Belder^{*}

We present a microfluidic free-flow electrophoresis chip with integrated monolithic partitioning bars for bubble-free μ FFE with high voltage efficiency.

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Wide-field Fluorescent Microscopy on a Cell-phone



Cost-effective and compact wide-field fluorescent imaging on a cell-phone

Hongying Zhu, Oguzhan Yaglidere, Ting-Wei Su, Derek Tseng and Aydogan Ozcan^{*}

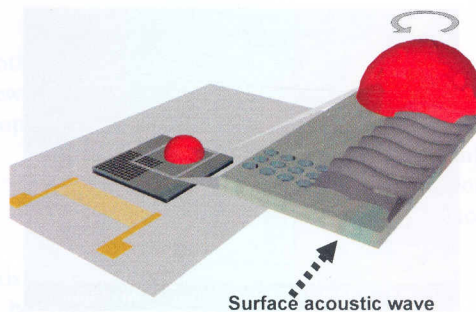
We demonstrate wide-field fluorescent microscopy on a cell-phone using a compact and cost-effective optical interface.

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Phononic crystal structures for acoustically driven microfluidic manipulations

Rab Wilson, Julien Reboud, Yannik Bourquin, Steven L. Neale, Yi Zhang and Jonathan M. Cooper*

We describe for the first time the use of phononic crystals for creating disposable and programmable microfluidic chips, actuated by surface acoustic waves, and demonstrate the concentration of blood cells in microlitre droplets.

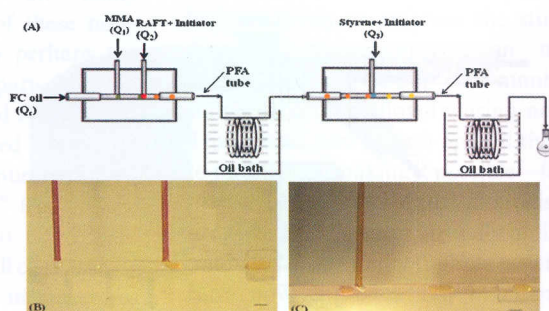


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Droplet synthesis of well-defined block copolymers using solvent-resistant microfluidic device

Phan Huy Hoang, Chi Thanh Nguyen, Jayakumar Perumal and Dong-Pyo Kim*

Well-defined block copolymers were synthesized by a new material based solvent-resistant lab on a chip device as a droplet generator that was serially connected with a capillary microreactor.



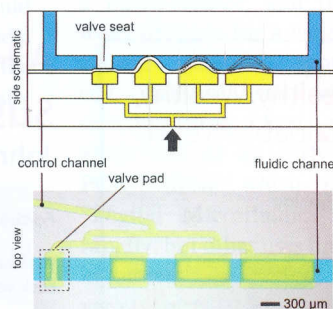
TECHNICAL NOTES

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Design and dynamic characterization of “single-stroke” peristaltic PDMS micropumps

Hoyin Lai and Albert Folch*

We present a monolithic membrane micropump consisted of three (or more) different-sized pumping elements that generates peristalsis with a single stroke of pressure.

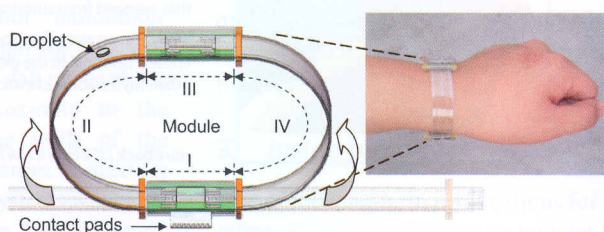


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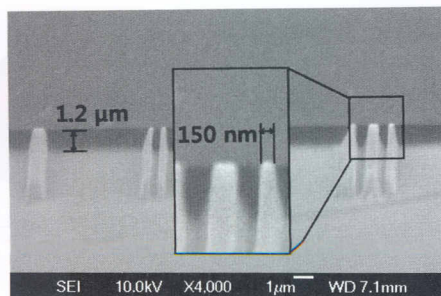
Droplet-on-a-wristband: Chip-to-chip digital microfluidic interfaces between replaceable and flexible electrowetting modules

Shih-Kang Fan,* Hanping Yang and Wensyang Hsu*

Long (8 inch), curved, closed, and wearable “droplet-on-a-wristband” is demonstrated by assembling four flexible and easy-to-attach/detach electrowetting modules fabricated by 4-inch wafer facilities.



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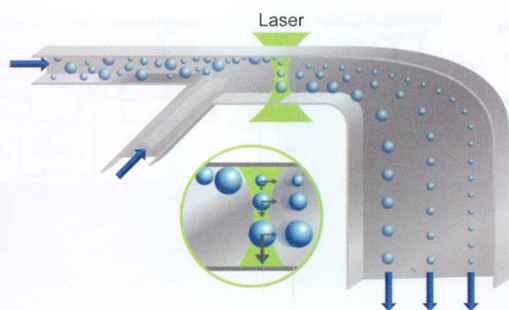


Simple fabrication of hydrophilic nanochannels using the chemical bonding between activated ultrathin PDMS layer and cover glass by oxygen plasma

So Hyun Kim, Yidan Cui, Min Jung Lee, Seong-Won Nam, Doorri Oh, Seong Ho Kang, Youn Sang Kim* and Sungsu Park*

Enclosed hydrophilic nanochannels were simply fabricated by coating low-viscosity PDMS as an adhesion layer onto the surface of the nanotrenches.

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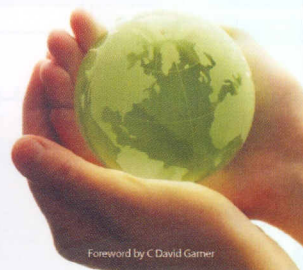
Enhancement by optical force of separation in pinched flow fractionation

Kyung Heon Lee, Sang Bok Kim, Kang Soo Lee and Hyung Jin Sung*

We demonstrate an optically enhanced pinched flow fractionation (OEPFF) device for size-based particle separation in a microchannel. This enhancement of separation is achieved by imposing an optical scattering force on the original PFF design.

A Healthy, Wealthy, Sustainable World

John Emsley



A Healthy, Wealthy, Sustainable World

John Emsley

Foreword by C David Garner

The world stands at a crossroads. What route to the future should we take? The road to a sustainable future beckons, but what effect will this have on chemistry, which appears so dependent on fossil resources?

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Written in an appealing style, this layperson's guide explains the roles of chemistry in areas of life ranging from the entirely personal to the global, as well as deconstructing several urban myths about chemicals.

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