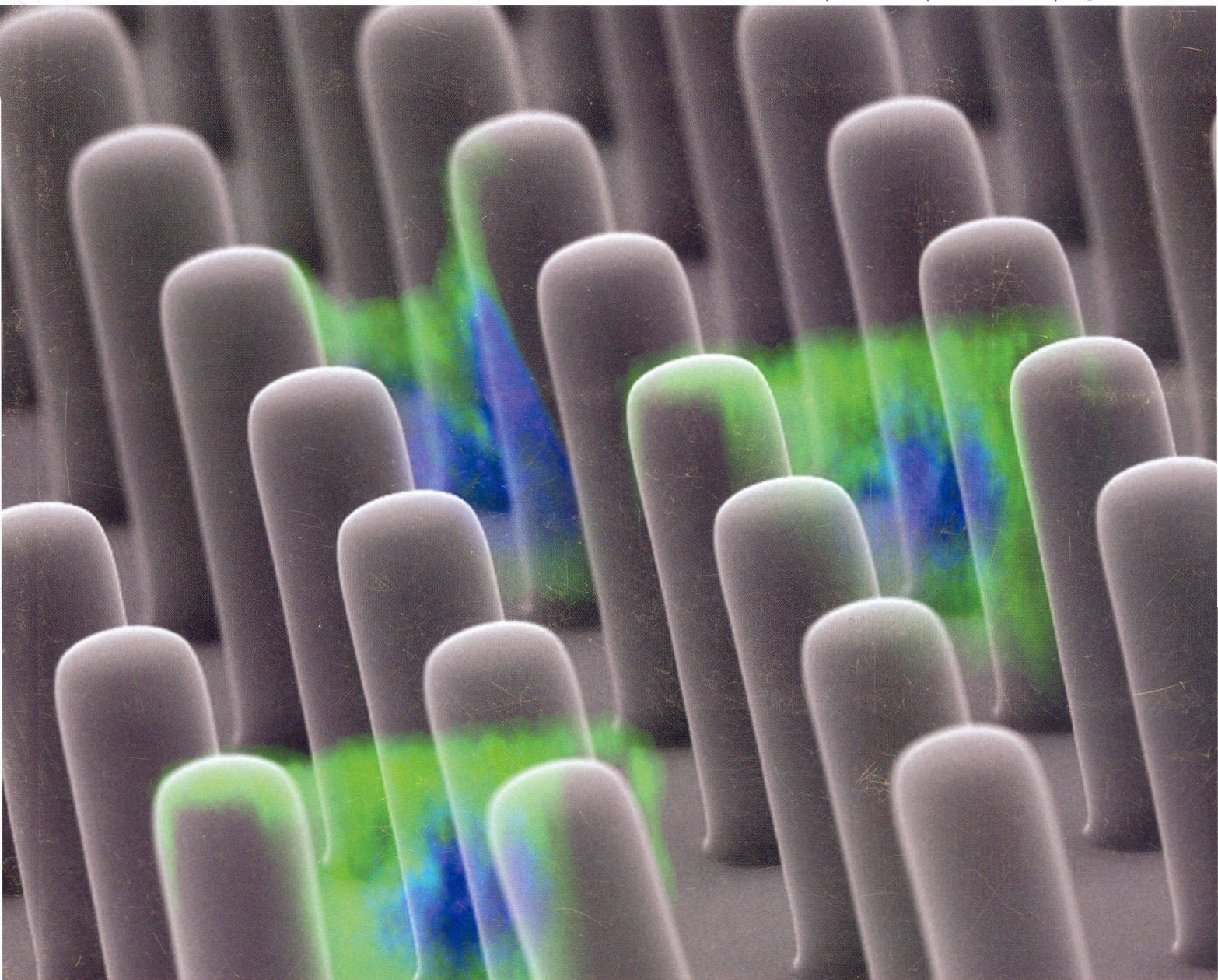


Lab on a Chip

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

www.rsc.org/loc

Volume 11 | Number 5 | 7 March 2011 | Pages 761-980



10th Anniversary: Focus on France

ISSN 1473-0197

RSC Publishing

PAPER

Ladoux *et al.*

Mechanics of cell spreading within 3D-micropatterned environments



1473-0197 (2011) 11:5;1-8

Lab on a Chip

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

www.rsc.org/loc

RSC Publishing is a not-for-profit publisher and a division of the Royal Society of Chemistry. Any surplus made is used to support charitable activities aimed at advancing the chemical sciences. Full details are available from www.rsc.org

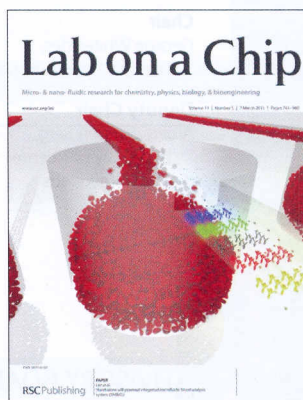
IN THIS ISSUE

ISSN 1473-0197 CODEN LCAHAM 11(5) 761-980 (2011)



Cover

See Ladoux *et al.*, pp. 805–812.
Image reproduced by permission
of Benoit Ladoux from *Lab Chip*,
2011, **11**, 805.



Inside cover

See Lee *et al.*, pp. 845–850.
Image reproduced by permission
of Ivan K. Dimov from *Lab Chip*,
2011, **11**, 845.

THEMED ISSUE: 10TH ANNIVERSARY FOCUS ON FRANCE

EDITORIAL

775

10th Anniversary Issue: France

Jean-Louis Viovy

Guest Editor Jean-Louis Viovy highlights the contribution of French research to micro and nanofluidics.

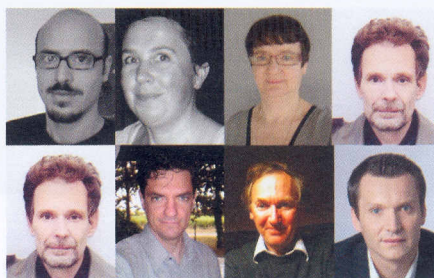


PROFILE

777

Contributors to the France issue

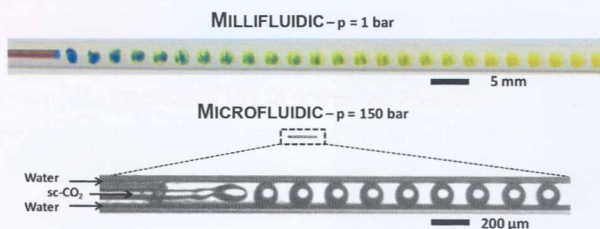
Lab on a Chip profiles the contributors to the 10th Anniversary France issue.



Some recent advances in the design and the use of miniaturized droplet-based continuous process: Applications in chemistry and high-pressure microflows

N. Lorber, F. Sarrazin, P. Guillot, P. Panizza, A. Colin, B. Pavageau, C. Hany, P. Maestro, S. Marre, T. Delclos, C. Aymonier, P. Subra, L. Prat, C. Gourdon and E. Mignard*

The synthesis of particles or the monitoring of chemical reactions can be conveniently performed in versatile droplet-based micro or millifluidic devices over a wide range of pressure.

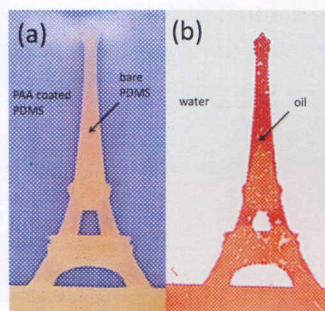


TUTORIAL REVIEWS

Microfluidics and complex fluids

Ph Nghe, E. Terriac, M. Schneider, Z. Z. Li, M. Cloitre, B. Abecassis and P. Tabeling*

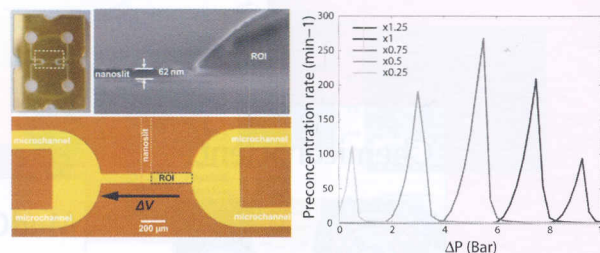
In the present paper, we show that complex flow studies may considerably benefit from microfluidic technology.



Ionic and mass transport in micro-nanofluidic devices: a matter of volumic surface charge

Adrien Plecis, Antoine Pallandre and Anne-Marie Haghiri-Gosnet*

The tuning of volumic surface charge in micro-nanofluidic devices can provide innovative biosorting systems such as selective preconcentrators.

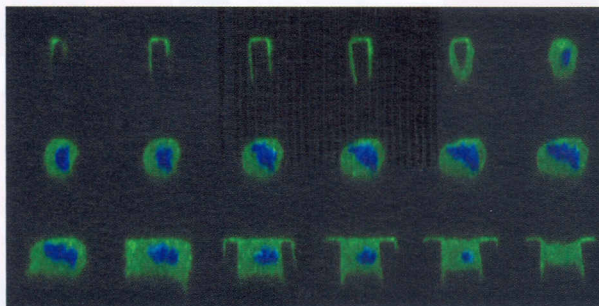


PAPERS

Mechanics of cell spreading within 3D-micropatterned environments

Marion Ghibaudo, Jean-Marc Di Meglio, Pascal Hersen and Benoit Ladoux*

We present an original use of flexible micropillar substrates to study the mechanical forces exerted by living cells as they spread within 3D microenvironments.

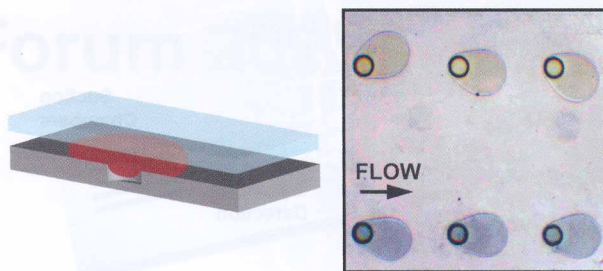


813

Rails and anchors: guiding and trapping droplet microreactors in two dimensions

Paul Abbyad, Rémi Dangla, Antigoni Alexandrou and Charles N. Baroud*

Channel height variations are used to anchor or guide droplets in two dimensions. Drops are anchored into arrays and their contents are controlled by gas exchange with the carrier oil.

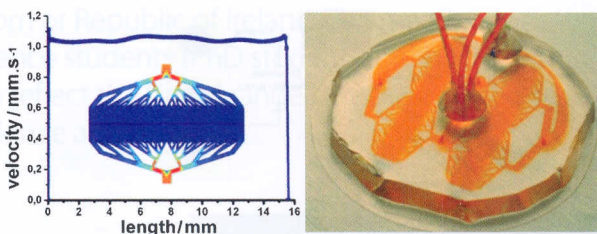


822

Design, modeling and characterization of microfluidic architectures for high flow rate, small footprint microfluidic systems

Laure Saias, Julien Autebert, Laurent Malaquin and Jean-Louis Viovy*

We present here a new strategy to design constant-depth microfluidic devices allowing a very high flow rate combined with a highly uniform velocity field and a small footprint.

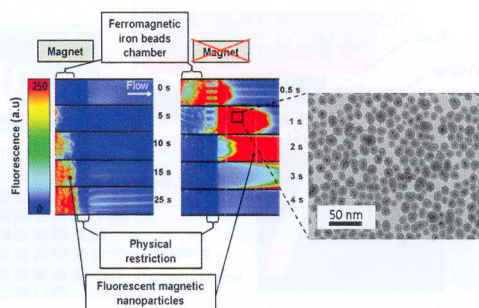


833

Magnetic core shell nanoparticles trapping in a microdevice generating high magnetic gradient

Bruno Teste, Florent Malloggi, Anne-Laure Gassner, Thomas Georgelin, Jean-Michel Siaugue, Anne Varenne, Hubert Girault and Stéphanie Descroix*

In this paper, we demonstrate the possibility of using a microdevice integrating a magnetic chamber that provides high magnetic gradient for an efficient and rapid trapping and release of 30 nm magnetic core shell nanoparticles.



REGULAR RESEARCH ARTICLES

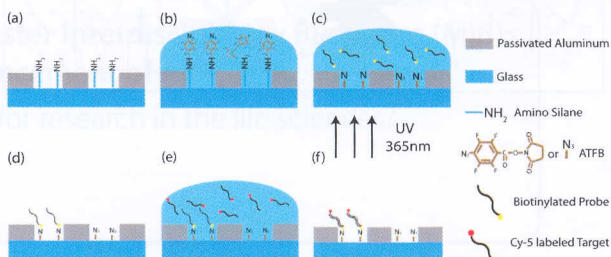
COMMUNICATION

841

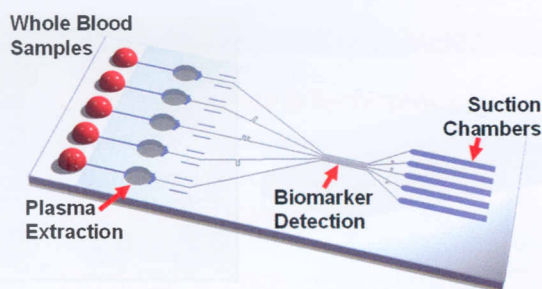
Photoactivated capture molecule immobilization in plasmonic nanoapertures in the ultraviolet

Sachin Attavar, Mohit Diwekar and Steve Blair*

We present a method for using the local electromagnetic field of plasmonic nanostructures to achieve spatially-localized immobilization of biomolecules.



845

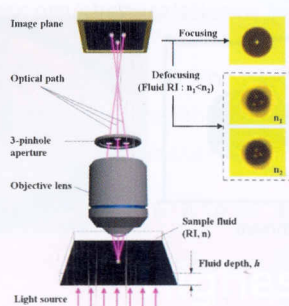


Stand-alone self-powered integrated microfluidic blood analysis system (SIMBAS)

Ivan K. Dimov, Lourdes Basabe-Desmots, Jose L. Garcia-Cordero, Benjamin M. Ross, Antonio J. Ricco and Luke P. Lee*

We present a stand-alone self-powered blood analysis system (SIMBAS) that incorporates trench based plasma extraction from whole-blood and analyte detection.

851

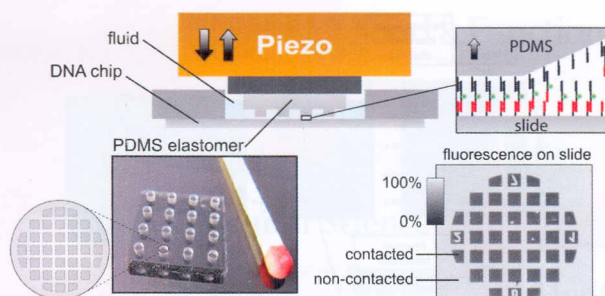


Microfluidic refractometer with micro-image defocusing

Sang Youl Yoon and Sung Yang*

We herein report on a novel micro-refractometer with a self-calibration function.

856

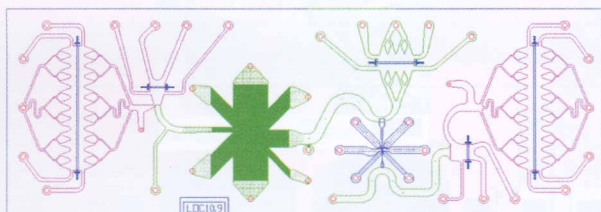


A high throughput molecular force assay for protein–DNA interactions

Philip M. D. Severin, Dominik Ho and Hermann E. Gaub*

We demonstrate a molecular force assay for highly sensitive and fast detection of protein–DNA interactions.

863

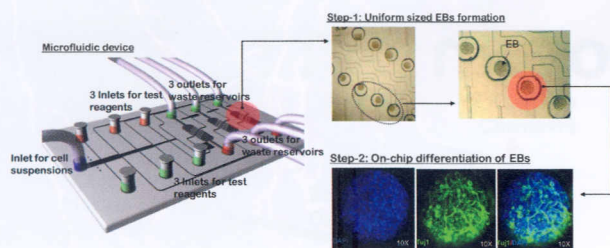


A lab-on-chip for biothreat detection using single-molecule DNA mapping

Robert H. Meltzer,* Jeffrey R. Krogmeier, Lisa W. Kwok, Richard Allen, Bryan Crane, Joshua W. Griffis, Linda Knaian, Nanor Kojanian, Gene Malkin, Michelle K. Nahas, Vyacheslav Papkov, Saad Shaikh, Kedar Vyavahare, Qun Zhong, Yi Zhou, Jonathan W. Larson and Rudolf Gilmanshin

The presented Lab-on-Chip is designed for rapid, specific, and sensitive detection of bacteria, viruses, and toxins collected from air.

874

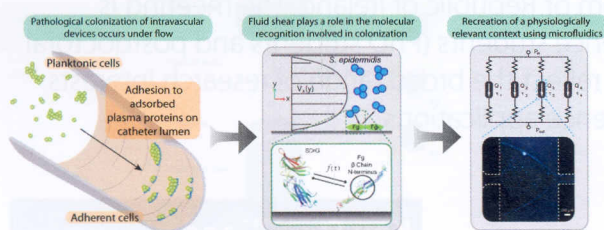


3-Dimensional cell culture for on-chip differentiation of stem cells in embryoid body

Choong Kim, Kang Sun Lee, Jae Hoon Bang, Young Eyn Kim, Min-Cheol Kim, Kwang Wook Oh, Soo Hyun Lee and Ji Yoon Kang*

This paper proposes a microfluidic device for the on-chip differentiation of an embryoid body (EB) formed in a microwell via 3-dimensional cultures of mouse embryonic carcinoma (EC) cells. The device adjusted the size of the EB by fluid volume, differentiated the EB by chemical treatment, and evaluated its effects in EC cells by on-chip immunostaining.

883

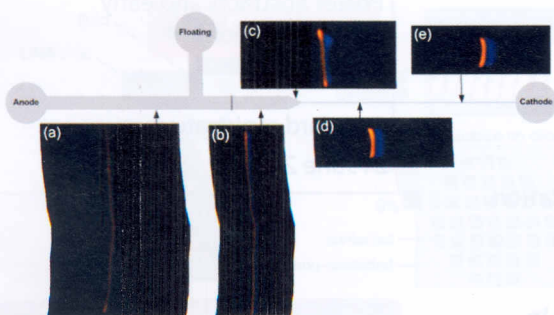


The effects of shear stress on isolated receptor–ligand interactions of *Staphylococcus epidermidis* and human plasma fibrinogen using molecularly patterned microfluidics

Westbrook M. Weaver, Shivani Dharmaraja, Vladana Milisavljevic and Dino Di Carlo

We present a simple and robust method of *in situ* channel wall patterning using flow boundaries. This technique, coupled with a parallel shear reactor channel design, allows for investigation into receptor–ligand interactions on the whole cell scale in a physiologically relevant context.

890

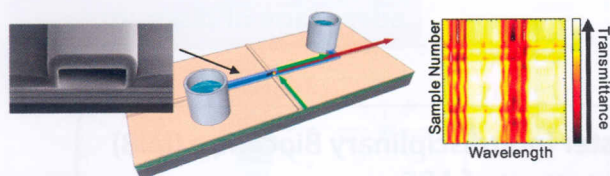


10 000-fold concentration increase of the biomarker cardiac troponin I in a reducing union microfluidic chip using cationic isotachopheresis

Danny Bottenus, Talukder Zaki Jubery, Yexin Ouyang, Wen-Ji Dong, Prashanta Dutta and Cornelius F. Ivory*

This paper presents the concentration of cardiac troponin I in a 3-D microfluidic chip platform with reductions in the cross-sectional area.

899



Tailorable integrated optofluidic filters for biomolecular detection

Philip Measor, Brian S. Phillips, Aiqing Chen, Aaron R. Hawkins and Holger Schmidt*

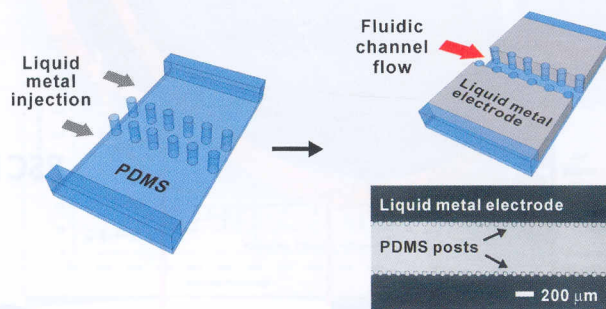
An ultrasensitive optofluidic chip that combines analyte transport and tailorable spectral filtering is introduced for biomolecular detection.

905

Inherently aligned microfluidic electrodes composed of liquid metal

Ju-Hee So and Michael D. Dickey*

Injecting liquid metal into specially designed microchannels produces correctly aligned microelectrodes that are stabilized mechanically by a thin oxide skin that forms on the liquid.

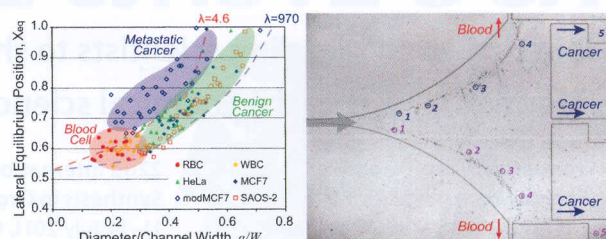


912

Deformability-based cell classification and enrichment using inertial microfluidics

Soojung Claire Hur, Nicole K. Henderson-MacLennan, Edward R. B. McCabe and Dino Di Carlo*

Inertial-focusing combined with deformability-induced migration is utilized for passive, label-free, target cell classification and isolation.

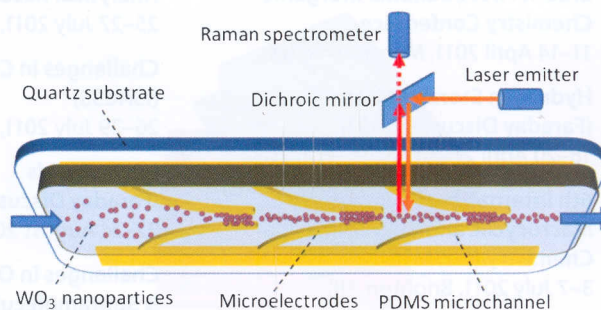


921

Dielectrophoresis–Raman spectroscopy system for analysing suspended nanoparticles

Adam F. Chrimes,* Aminuddin A. Kayani, Khashayar Khoshmanesh, Paul R. Stoddart, Paul Mulvaney, Arnan Mitchell and Kourosh Kalantar-zadeh

We report a novel method for *in situ* Raman measurements combined with dielectrophoresis, used for the manipulation, spatial mapping and selective determination of suspended nanoparticles.

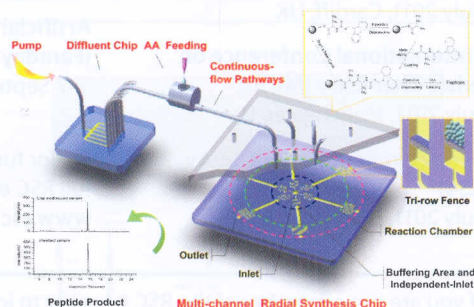


929

Integrated SPSS on continuous-flow radial microfluidic chip

Weizhi Wang, Yanyan Huang, Jizhong Liu, Yunfeng Xie, Rui Zhao,* Shaoxiang Xiong, Guoquan Liu, Yi Chen and Huimin Ma

An integrated radial microfluidic system featuring continuous-flow pathways, novel solid-phase supports and on-chip cleavage was developed for SPSS.

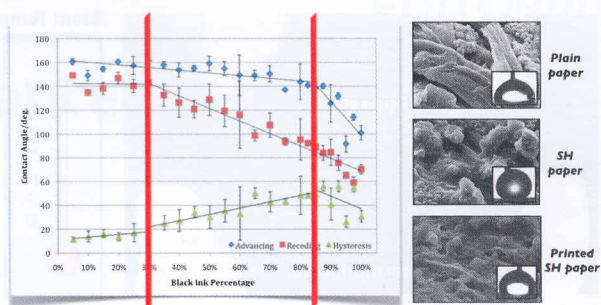


936

Producing a superhydrophobic paper and altering its repellency through ink-jet printing

David Barona and A. Amirfazli*

We developed new methods for: making superhydrophobic paper by spraying a nanocomposite film and manipulating its wetting characteristics through simple ink-jet printing technology.

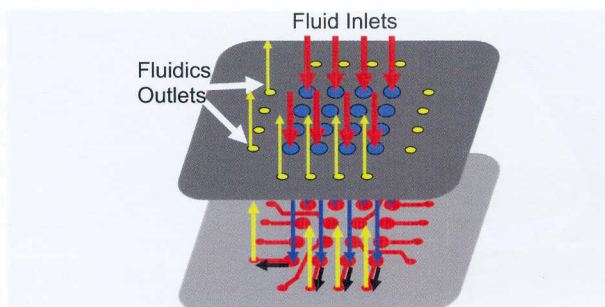


941

Lensless CCD-based fluorometer using a micromachined optical Söller collimator

Joshua Balsam, Miguel Ossandon, Yordan Kostov, Hugh Alan Bruck and Avraham Rasooly*

We describe a simple charge-coupled device (CCD) based lensless fluorometer with sensitivity in the range of current ELISA plate readers.

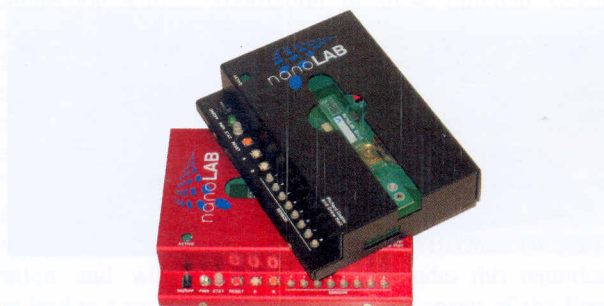


950

nanoLAB: An ultraportable, handheld diagnostic laboratory for global health

Richard S. Gaster, Drew A. Hall and Shan X. Wang*

Leveraging magnetic nanotechnology, we present a handheld and battery powered device capable of highly sensitive and multiplex point-of-care diagnostics.



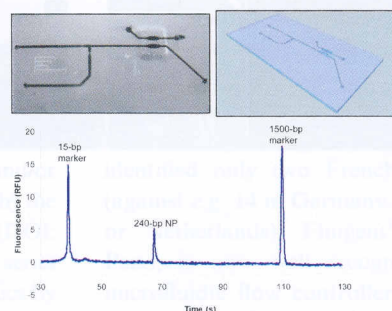
TECHNICAL NOTES

957

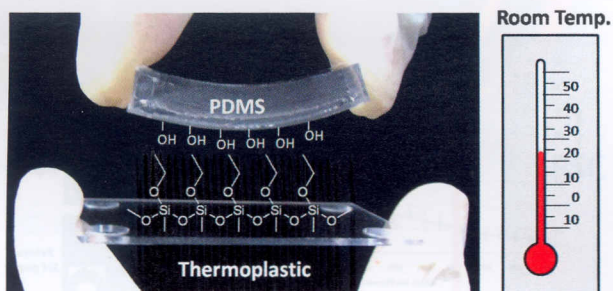
An integrated, valveless system for microfluidic purification and reverse transcription-PCR amplification of RNA for detection of infectious agents

Kristin A. Hagan, Carmen R. Reedy, Mari L. Uchimoto, Dipanwita Basu, Daniel A. Engel and James P. Landers*

A miniaturized device was developed capable of front-end sample preparation essential for detecting RNA-based infectious agents, integrating sample purification and reverse transcription PCR (RT-PCR) amplification for the identification and detection of influenza A.



962

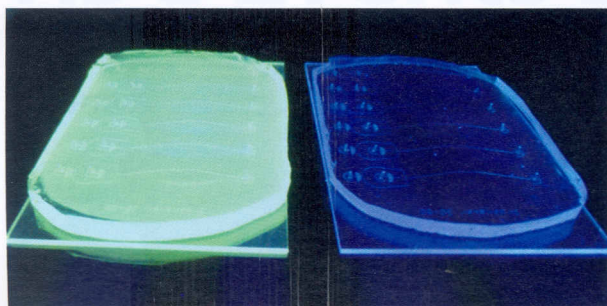


Simple room temperature bonding of thermoplastics and poly(dimethylsiloxane)

Vijaya Sunkara, Dong-Kyu Park, Hyundoo Hwang, Rattikan Chantiwas, Steven A. Soper and Yoon-Kyoung Cho*

We report a simple, versatile, instantaneous and irreversible method for bonding thermoplastics to elastomeric polydimethylsiloxane (PDMS) at room temperature.

966

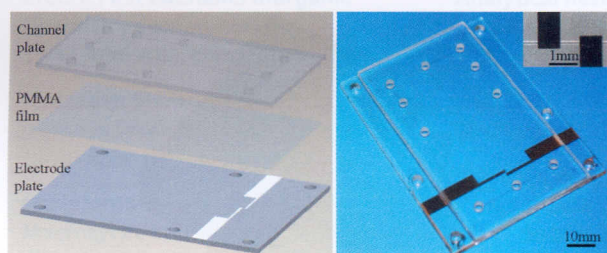


Reduced UV light scattering in PDMS microfluidic devices

Sebastian Seiffert,* Janine Dubbert, Walter Richtering and David A. Weitz

Fluorescent nanoparticles in PDMS microfluidic devices reduce UV light scattering in the elastomer, enhancing the spatial confinement of on-chip photoreactions.

969

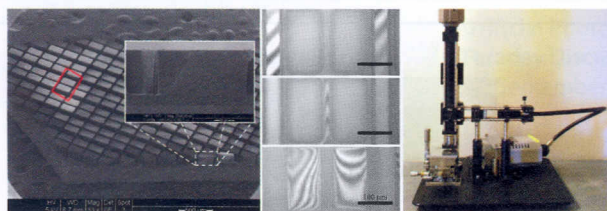


A three-layer PMMA electrophoresis microchip with Pt microelectrodes insulated by a thin film for contactless conductivity detection

Junshan Liu,* Junyao Wang, Zuanguang Chen, Yong Yu, Xiujuan Yang, Xianbin Zhang, Zheng Xu and Chong Liu

We propose a three-layer PMMA electrophoresis microchip with Pt microelectrodes insulated by a thin film for contactless conductivity detection.

974



A rapid and economical method for profiling feature heights during microfabrication

Gloria S. Yen, Bryant S. Fujimoto, Thomas Schneider, Desmond T.K. Huynh, Gavin D.M. Jeffries and Daniel T. Chiu*

A low-cost, rapid, and accurate method for measuring the heights of microfabricated structures by white-light interferometry.