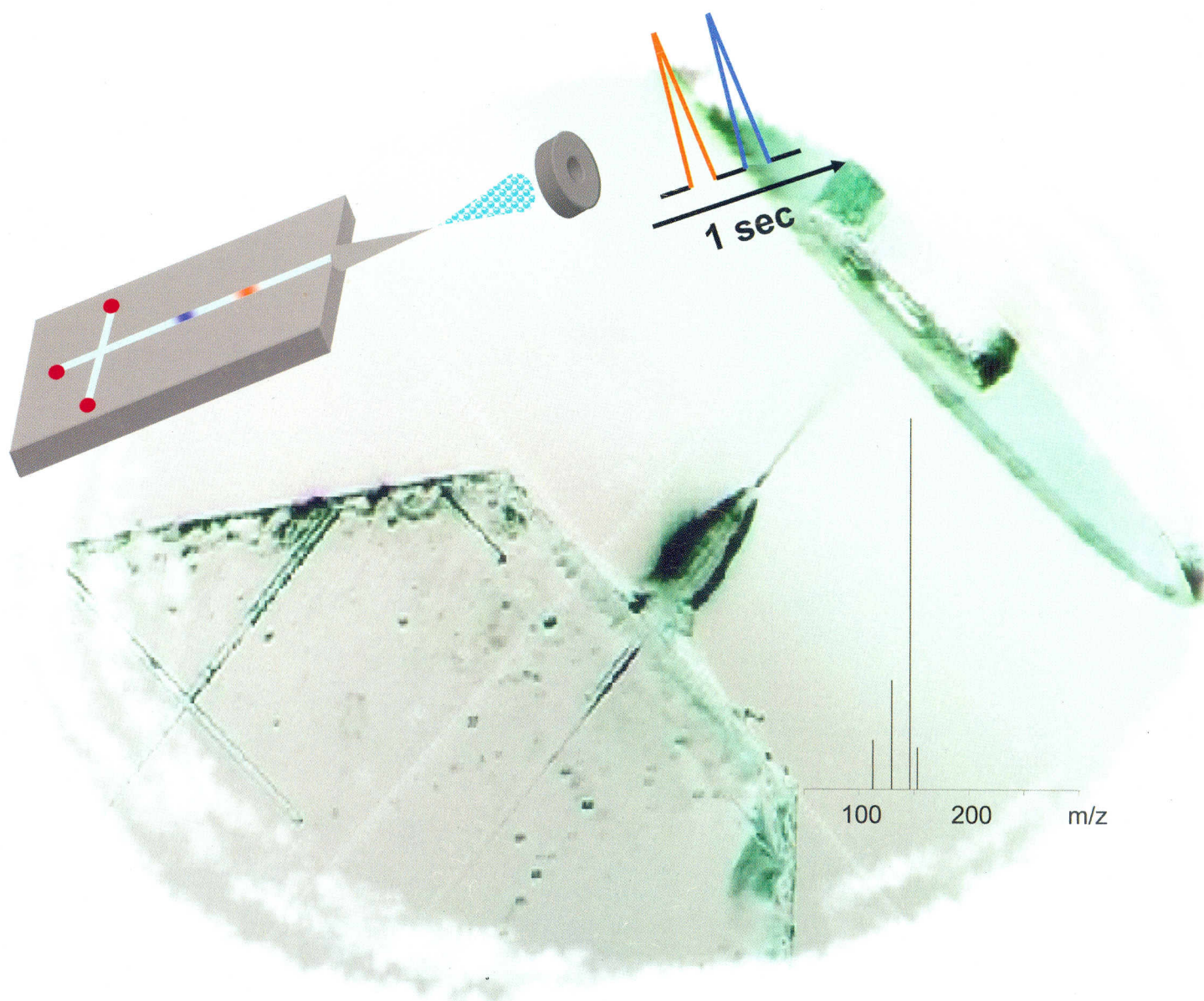


# Lab on a Chip

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

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Volume 10 | Number 10 | 21 May 2010 | Pages 1213–1336

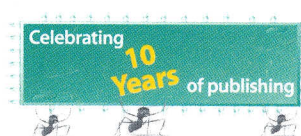


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RSC Publishing

Belder  
Chip electrophoresis mass spectrometry

Bohn  
Au-coated nanocapillary array  
membranes



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## IN THIS ISSUE

ISSN 1473-0197 CODEN LCAHAM 10(10) 1213–1336 (2010)



### Cover

See Belder *et al.*, pp. 1227–1230.  
Chip electrophoresis mass spectrometry in record speed: the cover shows a schematic drawing as well as a modified microscopic image of microfluidic glass chip, spraying in front of an MS-orifice. Image reproduced by permission of Stefanie Fritzsche, Peter Hoffmann and Detlev Belder from *Lab Chip*, 2010, **10**, 1227.



### Inside cover

See Frost and Bowser, pp. 1231–1236.  
Reducing surface tension diminishes the effect of electrolysis bubbles, dramatically improving analyte stream stability in Micro Free Flow Electrophoresis ( $\mu$ FFE). Image reproduced by permission of Nicholas W. Frost and Michael T. Bowser from *Lab Chip*, 2010, **10**, 1231.

## HIGHLIGHT

1225

### Research Highlights

Petra S. Dittrich\*

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



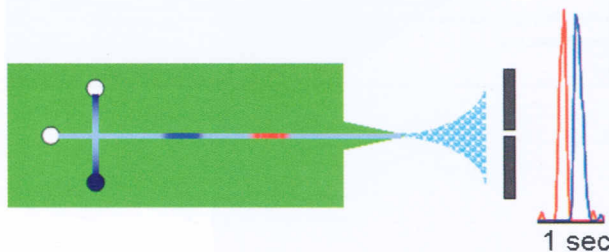
## PAPERS

1227

### Chip electrophoresis with mass spectrometric detection in record speed

Stefanie Fritzsche, Peter Hoffmann and Detlev Belder\*

The winning combination of microfluidic glass chips operated at very high field strength with a fast time of flight mass spectrometer enables electrophoretic separations with mass spectrometric detection within a second.

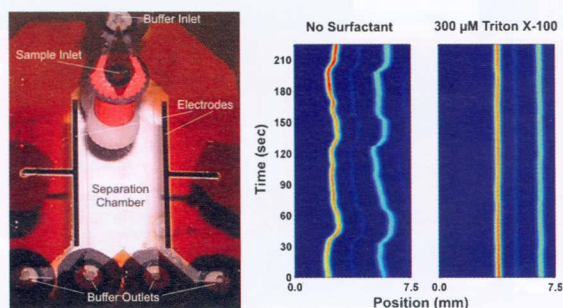


1231

### Using buffer additives to improve analyte stream stability in micro free flow electrophoresis

Nicholas W. Frost and Michael T. Bowser\*

Adding surfactant to the separation buffer reduces analyte stream instability caused by bubbles formed during electrolysis in micro free flow electrophoresis allowing long term operation of the device.

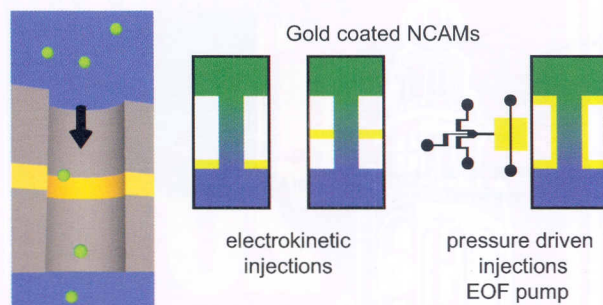


1237

### Electrokinetic control of fluid transport in gold-coated nanocapillary array membranes in hybrid nanofluidic–microfluidic devices

Aigars Piruska, Sean P. Branagan, Alexandra B. Minnis, Zhen Wang, Donald M. Cropek, Jonathan V. Sweedler and Paul W. Bohn\*

Three different strategies to achieve injections across Au NCAMs have been explored. EK injection across asymmetric Au NCAMs and FF-EK pumping across fully Au-coated NCAM can be achieved under restricted operating conditions.

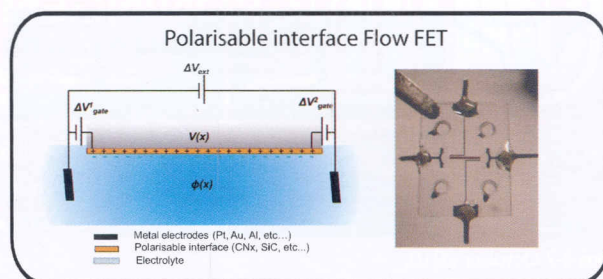


1245

### Flow field effect transistors with polarisable interface for EOF tunable microfluidic separation devices

A. Plecis,\* J. Tazid, A. Pallandre, P. Martinhon, C. Deslouis, Y. Chen and A. M. Haghiri-Gosnet

A novel method to control the zeta potential in microchannels using electrically polarisable interfaces is proposed and experimentally validated with three different interfaces at low ionic strength.

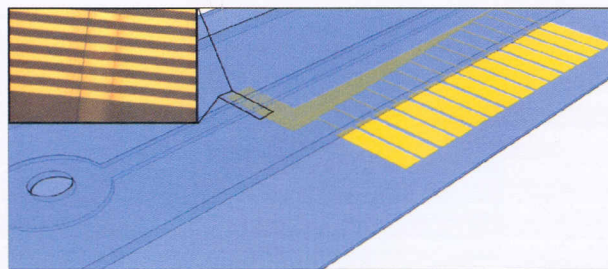


1254

### A cyclo olefin polymer microfluidic chip with integrated gold microelectrodes for aqueous and non-aqueous electrochemistry

Xavi Illa,\* Olga Ordeig, Detlef Snakenborg, Albert Romano-Rodríguez, Richard G. Compton and Jörg P. Kutter

An entirely polymeric microfluidic system with integrated gold microband electrodes has been analyzed by cyclic voltammetry to demonstrate the possibility of using it for organic electrosynthesis, as well as electroanalysis.

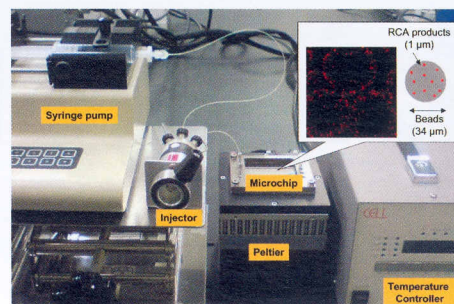


1262

### Microbead-based rolling circle amplification in a microchip for sensitive DNA detection

Kae Sato, Atsuki Tachihara, Björn Renberg, Kazuma Mawatari, Kiichi Sato, Yuki Tanaka, Jonas Jarvis, Mats Nilsson and Takehiko Kitamori\*

Rolling circle amplification (RCA) with padlock probes was integrated into a microchip. On-bead RCA for single molecule detection was employed on the chip.

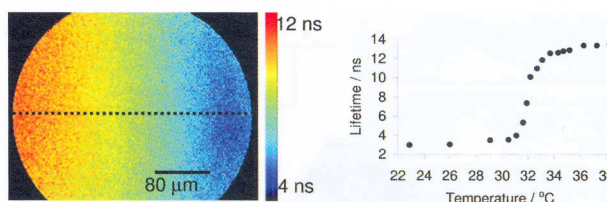


1267

### Quantitative mapping of aqueous microfluidic temperature with sub-degree resolution using fluorescence lifetime imaging microscopy

Emmelyn M. Graham, Kaoru Iwai, Seiichi Uchiyama, A. Prasanna de Silva, Steven W. Magennis\* and Anita C. Jones\*

The temperature of aqueous solutions in microfluidic devices can be mapped, on the micron scale, with a resolution of less than 0.1 °C by using fluorescence lifetime imaging microscopy (FLIM), and a water-soluble, thermo-responsive polymer as a probe.

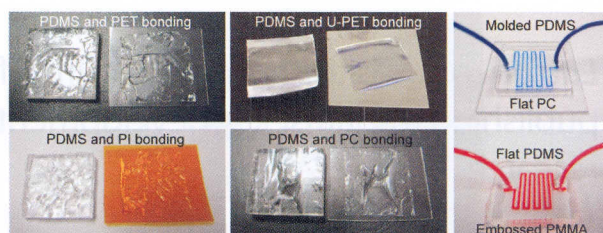


1274

### A facile route for irreversible bonding of plastic-PDMS hybrid microdevices at room temperature

Linzhi Tang and Nae Yoon Lee\*

The amine-epoxy based chemical gluing strategy ensures fast and robust bonding of the plastic-PDMS hybrid assembly at room temperature, and is universally applicable to various hard and soft plastic substrates, confirming the high fidelity of channel geometry. The bonded assembly is particularly suited for high-throughput fluidic experiments.

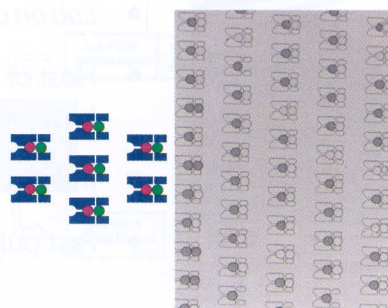


1281

### A double droplet trap system for studying mass transport across a droplet-droplet interface

Yunpeng Bai, Ximin He, Dingsheng Liu, Santoshkumar N. Patil, Dan Bratton, Ansgar Huebner, Florian Hollfelder, Chris Abell and Wilhelm T. S. Huck\*

Here we present the design, fabrication and operation of a microfluidic device to trap droplets in a large array of droplet pairs in a controlled manner.

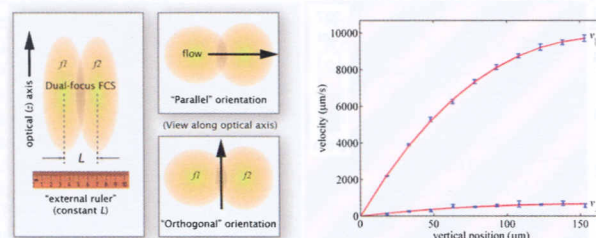


1286

### Application of dual-focus fluorescence correlation spectroscopy to microfluidic flow-velocity measurement

Tyler J. Arbour and Jörg Enderlein\*

Dual-focus fluorescence correlation spectroscopy is used to map the flow-velocity profile in a microcapillary. We demonstrate the specific advantages of the method in comparison to standard FCS and other velocity measurement techniques. The most attractive features include ease of use, high accuracy without calibration, single dye molecules as a tracer, and simultaneous  $x$ - and  $y$ -velocity information.

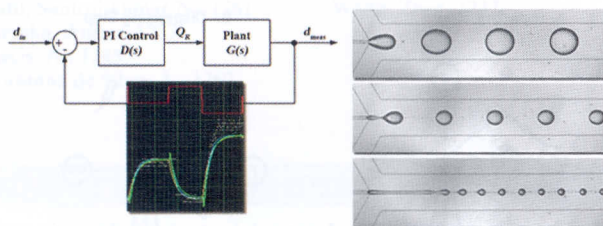


1293

### Microfluidic device incorporating closed loop feedback control for uniform and tunable production of micro-droplets

Erik Miller, Mario Rotea and Jonathan P. Rothstein\*

A closed loop negative feedback controller has been designed and implemented in the production of droplets in a co-flowing microfluidic device, allowing a user to select a uniform drop size with little to no prior knowledge of the immiscible fluids being used.

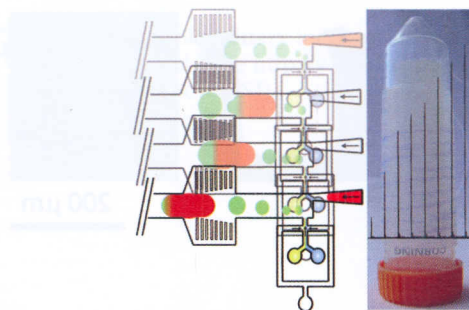


1302

### An automated two-phase microfluidic system for kinetic analyses and the screening of compound libraries

Jenifer Clausell-Tormos, Andrew D. Griffiths\* and Christoph A. Merten\*

We present an automated platform generating arrays of chemically distinct plugs (separated by immiscible oil) which can be split, subjected to the addition of further compounds and monitored over time.

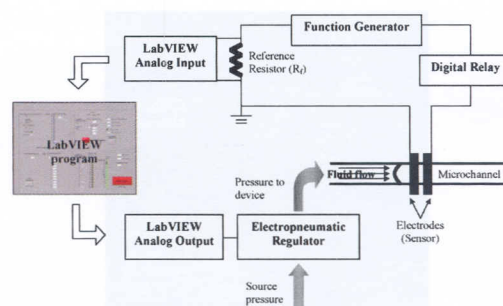


1308

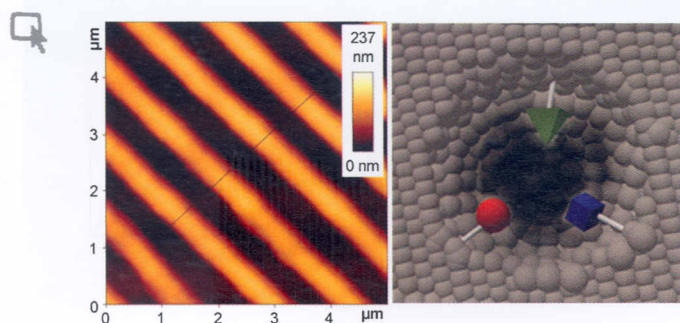
### Multiphase bioreaction microsystem with automated on-chip droplet operation

Fang Wang and Mark A. Burns\*

We have developed a multiphase (droplet-based) bioreaction microsystem with the capability of automatically controlling the size and position of the droplets using electronic sensing. This automated system can be used for a variety of applications including the amplification of DNA.



1316



### Nanopatterning molecularly imprinted polymers by soft lithography: a hierarchical approach

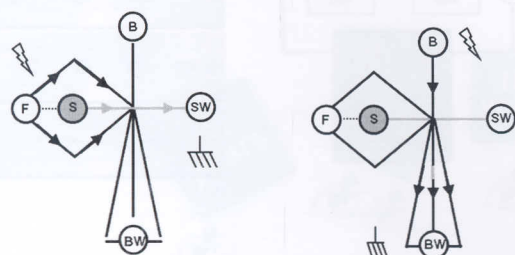
Hélène Lalo, Cédric Ayela,\* Etienne Dague, Christophe Vieu and Karsten Haupt\*

Soft lithography was used to pattern molecularly imprinted polymers at the nanoscale, yielding spatially-resolved nanometre-sized features of functional materials capable of specific molecular recognition.

1319

A. Loading Step

B. Dispensing Step

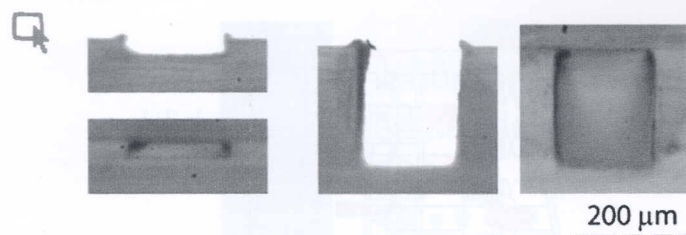


### Minimizing the number of voltage sources for pinched injection on a microfluidic device

Maximilien Blas, Erika L. Asselin, Tao Liu, Cristina Rodriguez, Roberto R. Panepucci and Bruce R. McCord\*

A novel chip design has been developed for performing pinched injections using a single power supply. This geometry minimizes injection time, and produces a focused sample plug in the central channel.

1324

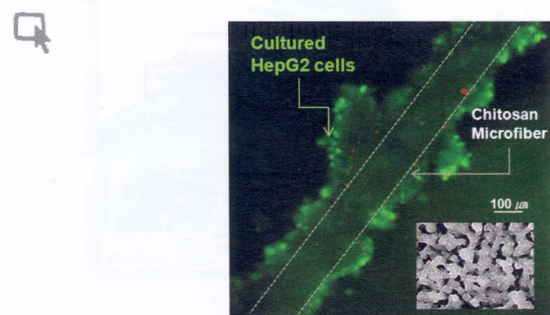


### Bonding of microfluidic devices fabricated in polycarbonate

D. Ogończyk, J. Węgrzyn, P. Jankowski, B. Dąbrowski and P. Garstecki\*

A simple method for bonding polycarbonate, based on controlled exposure of the pieces to vapours of solvents, yields a tight seal and unmodified geometry of the channels.

1328



### Microfluidic synthesis of pure chitosan microfibers for bio-artificial liver chip

Kwang Ho Lee, Su Jung Shin, Chang-Beom Kim, Jung Kyung Kim, Yong Woo Cho, Bong Geun Chung and Sang-Hoon Lee\*

Our method enables the production of pure chitosan fiber, and perfusable microfluidic chip for bio-artificial liver. HepG2 cells remain alive and aggregate with spheroid-like structures, showing higher liver specific function.