Advance Program

Optofluidics

Monday, 21 July 2008

ALL SESSIONS WILL BE HELD IN MARQUESA III

13.30 - 15.00

Session MF1: OPTOFLUIDICS I
Session Chair: Dominik G. Rabus, *Burkert Fluid Control Systems, Ingelfingen, Germany*

MF1.1 13.30 - 14.15
Optofluidics, D. Psaltis*, École Polytechnique Fédérale de Lausanne, Pasadena, CA, Switzerland*

ABSTRACT NOT AVAILABLE

MF1.2 14.15 - 14.45 (Invited)

Plasmonic Tweezers for Opto Fluidics, L. Y. Lin, X. Miao and B. Wilson*, University of Washington, Seattle, WA, USA*

Plasmonic tweezers, a new optical manipulation tool based on localized surface plasmon resonance, is shown to achieve versatile functionalities with high conversion efficiency. We report the demonstration of optical trapping, rotation, micro-fluidic mixing and concentration.

MF1.3 14.45 - 15.00

Single Virus Detection Using Integrated Optofluidics, M. I. Rudenko, S. Kuehn*, University of California - Santa Cruz, Santa Cruz, CA, USA*, E. J. Lunt*, Brigham Young University, Provo, UT, USA*, D. W. Deamer*, University of California - Santa Cruz, Santa Cruz, CA, USA*, A. R. Hawkins*, Brigham Young University, Provo, UT, USA* and H. Schmidt*, University of California - Santa Cruz, Santa Cruz, CA, USA*

Detection and analysis of single enterobacteria phage Qβ nucleocapsids on an integrated optofluidic chip are presented. Diffusion coefficient and flow velocity of the capsids were measured to be 16.4±0.5 $\mu m^2/s$ and 60-225 μm/s respectively.

15.00 - 15.30 **COFFEE BREAK**

15.30 - 16.30

Session MF2: OPTOFLUIDIC SENSORS
Session Chair: Holger Schmidt, *University of California - Santa Cruz, Santa Cruz, CA, USA*

MF2.1 15.30 - 16.00 (Invited)
Highly Efficient Fluorescence Sensing with Hollow Core Photonic Crystal Fibers, S. Smolka*, Technical University of Denmark, Kgs. Lyngby, Denmark*, M. Barth and O. Benson*, Humb[illegible]*

Cancelled

We investigate hollow core photonic crystal fiber[illegible]ce detection by selectively infiltrating the central hole with fluorophores. Dye concentrations down to 10^{-9} M c[illegible]liter sample volumes.

MF2.2 16.00 - 16.15

Nanoscale Optofluidic Sensor Arrays for Dengue Virus Detection, S. Mandal, J. Goddard and D. Erickson*, Cornell University, Ithaca, NY, USA*

Here we present Nanoscale Optofluidic Sensor Arrays (NOSAs) for Dengue virus detection, which is an optofluidic architecture for performing label free, highly parallel, detections of biomolecular interactions in aqueous environments with potential for a very low mass limit of detection.

MF2.3 16.15 - 16.30

Biaxial Nanohole Array Sensing and Optofluidic Integration, F. Eftekhari, C. Escobedo, J. Ferreira, P. Wood, R. Gordon, A. G. Brolo and D. Sinton*, University of Victoria, Victoria, BC, Canada*

Polarization dependent SPR-based sensing is demonstrated using a biaxial nanohole array. This enables increased spectral diversity and sensitivity with single line excitation. Towards further optofluidic integration, a flow-through array detection scheme is evaluated computationally.

Tuesday, 22 July 2008

09.00 - 10.00

Session TuF1: Optofluidics II
Session Chair: Demetri Psaltis, *École Polytechnique Fédérale de Lausanne, Pasadena, CA, Switzerland*

TuF1.1 09.00 - 09.30 (Invited)

Particle Manipulation with Integrated Optofluidic Traps, S. Kuehn, P. Measor, *University of California - Santa Cruz, Santa Cruz, CA, USA*, E. J. Lunt, A. R. Hawkins, *Brigham Young University, Provo, UT, USA* and H. Schmidt, *University of California - Santa Cruz, Santa Cruz, CA, USA*

On an integrated optofluidic waveguide platform we implement two complementary types of traps, in a transverse and a novel axial geometry. The traps are characterized and used to manipulate and study biomaterial.

TuF1.2 09.30 - 10.00 (Invited)

Micro-Fluidic-Based Optical Detection Platform for Characterizing Fluorescing Objects with Integrated Wavelength Detection, P. Kiesel, M. Beck, M. Bassler and N. M. Johnson, *Palo Alto Research Center, Palo Alto, CA, USA*

We describe a compact, low-cost analyte detection platform that combines a fluidic channel, large area fluorescence excitation and on chip wavelength detection. The unit is optimized to record native fluorescence spectra from moving analytes.

10.00 - 10.30 COFFEE BREAK

10.30 - 12.00

Session TuF2: Optofluidic Devices
Session Chair: TBD

TuF2.1 10.30 - 11.00 (Invited)
Optofluidic Device for Molecular Detection via Surface Enhanced Raman Spectroscopy, M. Wang, N. Jing, I. Chou, G. L. Cote and J. Kameoka, *Texas A&M University, College Station, TX, USA*

An optofluidic device was developed to improve the reproducibility and sensitivity of surface enhanced Raman spectroscopy. As the demonstration, this has been used to detect β-amyloid peptide, one of the biomarkers for Alzheimer's disease.

TuF2.2 11.00 - 11.15

Image-based Cell Sorting Using Optofluidics, J. R. Kovac and J. Voldman, *Massachusetts Institute of Technology, Cambridge, MA, USA*

We present an optofluidic architecture that combines a passive 10,000-site array of microwell cell traps and optically-mediated trap release in a microfluidic environment to yield a functional platform for image-based sorting of cells.

TuF2.3 11.15 - 11.30

Light Image Patterned Molecular Delivery into Live Cells Using Gold Particle Coated Substrate, T.-H. Wu, S. Kalim, C. Callahan, M. Teitell and P.-Y. Chiou, *University of California - Los Angeles, Los Angeles, CA, USA*

Light-patterned molecular delivery into cells is demonstrated by pulsed laser irradiation of gold particles immobilized on the substrate below a cell monolayer. Molecular delivery is verified by observing the uptake of membrane-impermeable fluorescent dye.

TuF2.4 11.30 - 11.45

Characterization of Optofluidic ARROW Rejection Filter Devices, P. Measor, *University of California - Santa Cruz, Santa Cruz, CA, USA*, E. J. Lunt, C. Jones, A. R. Hawkins, *Brigham Young University, Provo, UT, USA* and H. Schmidt, *University of California - Santa Cruz, Santa Cruz, CA, USA*

We experimentally demonstrate wavelength filtering of integrated solid- and liquid-core antiresonant reflecting optical waveguide devices with a range of 8-54 dB rejection and 2-29 nm stopbands.

TuF2.5 11.45 - 12.00

Spectrographic Fluidic Memory using Electroactive Nanowell Arrays, B. Cordovez, *Cornell University, Ithaca, NY, USA*, D. Psaltis, *École Polytechnique Fédérale de Lausanne, Pasadena, CA, Switzerland* and D. Erickson, *Cornell University, Ithaca, NY, USA*

We present an optofluidic memory architecture that enables the reading and erasing of multiple bit information packages on single light diffraction limited data marks by exploiting spectral and intensity multiplexing of colloidal quantum dot cocktails.

12.00 - 13.30 LUNCH BREAK

13.30 - 15.00

Session TuF3: OPTOFLUIDIC PHOTONICS
Session Chair: TBD

TuF3.1 13.30 - 14.00 (Invited)
In-Plane Tunable Optofluidic Microlenses, X. Mao, B. K. Juluri, S.-C. Lin, J. Shi, M. I. Lapsley and J. Huang, *Pennsylvania State University, University Park, PA, USA*

We introduce two in-plane tunable optofluidic microlens configurations for flexible on-chip light focusing and collimation within a microfluidic device, including (1) an optofluidic cylindrical microlens and (2) a liquid gradient refractive index (L-GRIN) lens.

TuF3.2 14.00 - 14.15

Novel Concept in Electro-Wettability Patterning with Electrodes-less Configuration to Activate and Control Liquid Microlens Arrays on Functionalized Polar Electric Substrates, P. Ferraro, S. Grilli and L. Miccio, *Istituto Nazionale di Ottica Applicata, Pozzuoli, Naples, Italy*

Liquid Microlens Array can be obtained by using a thin layer of liquid on a functionalised $LiNbO_3$ substrate. The array is activated and controlled by electrowetting patterning and is driven by pyroelectric effect.

TuF3.3 14.15 - 14.30

Simultaneous Exhibition of Positive and Negative Nonlinear Response of Dye-Doped Liquid Crystal with Polarization Dependence of the Z-scan Technique, A. A. Rodriguez-Rosales, R. Ortega-Martinez, O. G. Morales-Saavedra, C. J. Roman-Moreno, *Universidad Nacional Autónoma de México, Mexico, D.F., Mexico*, M. D. Iturbe-Castillo and R. Ramos-Garcia, *Instituto Nacional de Astrofísica, Optica y Electronica, Tonantzintla, Puebla, Mexico*

The Z-scan technique was use to study the negative and positive nonlinear refractive index responses of methyl-red doped 5CB liquid crystals samples as a function of a He-Ne laser beam polarization.

TuF3.4 14.30 - 14.45

Optofluidic Assembly of Microdisk Lasers on a Silicon Chip, A. T. Ohta, M.-C. Tien, K. Yu, S. L. Neale and M. C. Wu, *University of California - Berkeley, Berkeley, CA, USA*

A room-temperature optofluidic assembly process to integrate III-V microdisk lasers on a silicon chip is demonstrated. The assembly is accomplished using lateral-field optoelectronic tweezers, which achieves an unoptimized placement accuracy of approximately ±0.25 μm.

TuF3.5 14.45 - 15.00

Reconfigurable Silicon-Based Photonic Crystal Components Using Microfluidics, C. Karnutsch, U. Bog, B. J. Eggleton, *CUDOS, University of Sydney, Sydney, NSW, Australia* and T. F. Krauss, *University of St. Andrews, St. Andrews, Fife, UK*

We demonstrate reconfigurable microfluidic photonic crystal components in silicon-based membranes by select hole infiltration. We employ a diverse range of fluids and show the capability of filling a single hole. Systematic characterisations of the induced defects are presented.

15.00 - 15.30 COFFEE BREAK

15.30 - 16.30

Session TuF4: OPTOFLUIDIC FABRICATION TECHNOLOGIES
Session Chair: Jun Huang, *Pennsylvania State University, University Park, PA, USA*

TuF4.1 15.30 - 16.00 (Invited)
Synthesis of Photopolymerized Microstructures in Microfluidic Channels for Smart Scalable Systems, S. E. Chung, W. Park, H. Park, S. Shin, S. A. Lee and S. Kwon, *Seoul National University, Seoul, Korea*

We introduce 'optofluidic maskless lithography system' that can dynamically synthesize free-floating polymeric microstructures inside microfluidic channels with high-speed two-dimensional spatial light modulators, and propose 'railed microfluidics,' an agile method to guide and assemble microstructures inside fluidic channels.

TuF4.2 16.00 - 16.15

Fabrication and Characterization of a Liquid Core Integrated Interferometer., R. Bernini, *Istituto per il Rilevamento Elettromagnetico dell'Ambiente, Naples, Na, Italy*, G. Testa, L. Zeni, *Dii, Seconda Universit Di Napoli, Aversa, Na, Italy* and P. M. Sarro, *Delft University of Technology, Delft, The Netherlands*

We report the fabrication and the characterization of a microfluidic Mach-Zehnder interferometer based on liquid core antiresonant reflecting optical waveguide (ARROW). The results show that interferometers with a good visibility can be achieved in good agreement with the theoretical results.

TuF4.3 16.15 - 16.30

An All Polymer Optofluidic Chip with Integrated Waveguides for Biophotonics, T. Mappes, *University of Karlsruhe, Karlsruhe, Baden-Wrttemberg, Germany*, S. Lenhert, O. Kassel, *Forschungszentrum Karlsruhe GmbH, Karlsruhe, Baden-Wrttemberg, Germany*, C. Vannahme, *Forschungszentrum Karlsruhe GmbH, Karlsruhe, BW, Germany*, M. Schelb, *University of Karlsruhe, Karlsruhe, BW, Germany* and J. Mohr, *Forschungszentrum Karlsruhe GmbH, Karlsruhe, Baden-Wrttemberg, Germany*

Miniaturized optofluidic systems with integrated waveguides and microfluidic channels were built as monolithic polymer devices. Their potential for biosensor applications was demonstrated. Channels functionalized by Dip-Pen-Nanolithography with fluorescence markers allowed selective capture of fluorescent markers and their detection by local excitation through the waveguides.

END OF PROGRAM