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9:00 - 11:00 Opening Ceremony of World of Photonics Congress and LASER World of PHOTONICS, Room 1

11:00-12:30 Energy - Environment

Location: Room 22, 2nd Floor, Congress Centre
Session Chair: Demetri Psaltis

Invited Talk **11:00 Optofluidics for self-tracking solar concentration** 1

Christophe Moser
EPFL, Switzerland
Self-tracking solar concentration passively aligns a solar concentration system to the changing sun's position. Micro-mechanical actuators based on the phase change of either a liquid or a solid can be exploited to obtain a large acceptance angle (>30 degrees) while maintaining a medium concentration (up to 200).

Invited Talk **11:30 Optofluidics for Energy Applications** 3

David Sinton
University of Toronto, Canada
Microfluidic and optofluidic methods developed primarily for medical applications have much to offer the energy sector. This talk will describe my group's recent work in two areas: (1) microfluidics and optofluidics for bioenergy and (2) microfluidics for fluids underground: CO2, oil and gas. Within the bioenergy theme, we are developing photobioreactors to quantify and increase the productivity of microalgae. Within the fluids underground theme we are developing a suite of methods to study (a) pore-scale transport and reactivity, and (b) relevant fluid properties. I will close the talk with an overview of future opportunities for optofluidics in advancing renewable technologies and improving legacy energy operations.

Invited Talk **12:00 Optofluidics biochip for rapid algae population screening** 4

Yves Bellouard[1], Allison Schaap[2]
[1]Ecole Polytechnique Fédérale de Lausanne, Switzerland; [2]Eindhoven University of Technology, Netherlands;
The rapid identification of algae populations is not only of practical importance for assessing the water quality of watersheds in general, but also for future exploitation of algae as an energy source. Here we demonstrate how an integrated optofluidics device fabricated by femtosecond laser processing and chemical etching can provide a robust and yet, efficient rapid identification means.

12:30-14:30 LUNCH BREAK

14:30– 16:00 Optofluidic Biotechnology

Location: Room 22, 2nd Floor, Congress Centre
Session Chair: Timo Mappes

Invited Talk **14:30 Mid-IR Plasmonics for Time-Resolved and Ultra-Sensitive Vibrational Biospectroscopy** 6

Hatice Altug, Dordaneh Etezadi, Odeta Limaj, Daniel Lopez, Ronen Adato
EPFL, Switzerland
We will present a plasmonic-fluidic technology performing real-time and ultra-sensitive infrared (IR) absorption spectroscopy in aqueous environment by directly accessing distinct molecular and structural specific chemical fingerprints of biomolecules. We will demonstrate that the technology is uniquely capable of monitoring protein interaction kinetics and biomimetic cell membranes without using any external labels. By leveraging engineered plasmonic antennas for IR absorption enhancement and demonstrating their use for biologically significant measurements in solution, our results represent a dramatic advance over previous studies.

15:00 Fiber-based platform for tracking unlabeled nanoparticles with elastic light scattering 7

Sanli Faez[1], Yoav Lahini[2,3], Stefan Weidlich[4,5], Rees F. Garmann[2], Katrin Wondraczek[4], Matthias Zeisberger[4], Markus A. Schmidt[4], Michel Orrit[1], Vinothan N. Manoharan[2]

[1]Leiden University, Huygens-Kamerlingh Onnes Laboratory, Leiden, The Netherlands; [2]Harvard University, Department of Physics, Cambridge, MA, USA; [3]MIT, Department of Physics, Cambridge, MA, USA; [4]Leibnitz Institute of Photonic Technology, Jena, Germany; [5]Heraeus Quarzglas GmbH and Co. KG, Hanau, Germany

We present a tracking method based on detection of elastic light scattering from diffusing particles inside a nano-fluidic silica fiber. Using this method, we have tracked the diffusion of unlabeled 26-nm cowpea chlorotic mottle virions and 20-nm latex particles at rates of over 3 kHz. Our setup can be easily incorporated into common optical microscopes and extends their detection range to nanometer-scale particles and macromolecules. The ease-of-use and performance of this technique support its potential for widespread applications in medical diagnostics.

15:15 Biolasing from fluorescent proteins and live bacterial cells suspended in liquid droplet microcavities 9

Alexandr Jonas[1], Mehdi Aas[2], Yasin Karadag[2], Selen Manioglu[2], Suman Anand[3], David McGloin[3], Halil Bayraktar[2], Alper Kiraz[2]

[1]Istanbul Technical University, Turkey; [2]Koc University, Turkey; [3]University of Dundee, United Kingdom

We report miniature optofluidic biolasers that exploit active liquid optical resonators formed by surface-supported aqueous microdroplets containing purified yellow fluorescent protein or a suspension of live E. coli bacteria cells expressing the fluorescent protein. We characterize the dynamics of lasing emission from these biological gain media and show that a single micron-sized fluorescent bacterial cell confined in a droplet-based cavity can serve as a laser gain medium. Aqueous droplet microcavities allow the maintenance of the bacteria under conditions compatible with unimpeded growth. Therefore, our results also suggest a route to microscopic sources of laser light with self-regenerating gain media.

Invited Talk **15:30 Biological Optofludic Lenses** 11

Pietro Ferraro

Istituto di Cibernetica, Italy

We show that the Red Blood Cells (RBC) can work as a tuneable liquid lenses. Imaging properties of RBCs are proofed. Moreover, fast diagnostic blood screening is demonstrated by testing RBCs by adaptive-optics technology.

16:00-16:30 COFFEE BREAK

16:30– 18:00 Applications in Biology

Location: Room 22, 2nd Floor, Congress Centre
Session Chair: Andreas E. Vasdekis

Invited Talk **16:30 Affinities, Kinetics and Synthetic Life with optically generated Temperature Fields** 13

Dieter Braun

LMU Munich, Germany

The movement of proteins in a temperature gradient is a sensitive and versatile way to probe all-optically protein interactions, including fragment screens for pharmaceutical compounds. The physical basis of the movement was studied with DNA and polystyrene beads and could be understood with a capacitor model of ionic shielding. Recently, we were able to achieve thermophoretic movement inside living cells. The method was brought to the market with the award winning Startup company NanoTemper. Fast reaction speed inside living cells can be measured using fast temperature oscillations and a molecular lock-in method.

17:00 Optical DEP for immobilization and orientation of microbial organisms 14

Lisa Miccio, Valentina Marchesano, Martina Mugnano, Simonetta Grilli, Pietro Ferraro

CNR, Italy

Biofilms formation is a critical issue in several fields as health-care and food-enterprise. Biofilm growth depend on the bacteria spatial organization. Here, an innovative electrode-free dielectrophoresis is applied for immobilization and orientation of Escherichia Coli.

17:15 Micro flow vane & Brownian probes: Applications of optical forces in the near-field of nanocavities 16

Christophe Pin[1,2,3], Claude Renaut[1,2,4], Emmanuel Picard[2], David Peyrade[3], Emmanuel Hadji[2], Frédérique De Fornel[1], Benoit Cluzel[1]

[1]Université de Bourgogne, France; [2]CEA, France; [3]CNRS, France; [4]ICFO, Spain

Operating at the nanoscale without any contact, near-field optical forces offer interesting practical advantages. Two original applications of optical forces in the near-field of photonic nanocavities are investigated. We report first on the demonstration of a self-assembled micro flow vane. Then we explore the possibility of imaging the optical near-field of nanocavities using optically trapped particles as Brownian probes.

Invited Talk **17:30 On-chip light sheet illumination enables accurate size and concentration measurements of extracellular vesicles in biological fluids** 18

Kevin Braeckmans

Ghent University, Belgium

Here we present a disposable microfluidic chip with integrated light sheet illumination for fSPT size and concentration measurements [6]. The sheet of light only illuminates EVs in the focal plane of the microscope's detection lens so that contrast is markedly improved. On-chip fSPT measurements were performed on cell-derived EVs secreted in cell culture medium of breast cancer cells. A 4× higher concentration was found using the microfluidic chip with a size distribution shifted towards smaller values. On-chip fSPT measurements were subsequently successfully performed on EVs secreted in interstitial fluid harvested from human breast cancer specimens.

18:00 - 21:00 International Year of Light 2015 Opening Reception, Foyer ICM

EOSOF– Tuesday, June 23

8:30– 10:00 Fundamental Optofluidics 1

Location: Room 22, 2nd Floor, Congress Centre
Session Chair: Aram Chung

Invited Talk **8:30 Optical Manipulation with Random Light Fields: From Fundamental Physics to microfluidics** 20

Giorgio Volpe[1,3], Lisa Kurz[1], Agnese Callegari[2], Giovanni Volpe[2,4], Sylvain Gigan[1]

[1]Laboratoire Kastler Brossel, France; [2]Soft Matter Lab, Physics Department,Turkey; [3]Department of Chemistry, University College London, United Kingdom; [4]UNAM – National Nanotechnology Research Center, Bilkent University, Turkey

Speckles are random light fields that share some universal statistical properties. Because of this, they can be used to perform deterministic optical manipulation tasks on a Brownian particle as well as control its diffusion properties. I will present some numerical exemples, as well as proof-of-principle experimental demonstration.

9:00 A light-controlled optofluidic switch using ZnO as actuating material 21

Ioannis Konidakis, Maria Konstantaki, Stavros Pissadakis

Foundation for Research and Technology, Greece

We hereby report on a reversible optofluidic switch of a ZnO-overlaid microstructured optical fiber Fabry-Perot interferometer, based on an all-light controlled actuation mechanism upon exposure to ultraviolet (248 nm) and green (532 nm) laser radiation.

9:15 Optofluidic droplet router 23

Michael Esseling[1], Annamaria Zaltron[2], Wolfgang Horn[1], Cornelia Denz[1]

[1]University of Muenster, Germany; [2]University of Padua, Italy

An optofluidic droplet router for the manipulation of free-flowing liquid droplets is presented. The device consists of a custom-made PDMS droplet generator sealed by a photorefractive lithium niobate crystal as the bottom layer. Upon structured illumination, dielectrophoretic forces act on the droplets, guiding them on a light-shaped network.

9:30 Air-suspended polymer grating coupler applied as optofluidic refractive index sensor 25

Christoph Prokop[1,3], Nico Irmler[1], Bert Lägel[2], Sandra Wolff[2], Arnan Mitchell[3], Christian Karnutsch[1]
[1]Karlsruhe University of Applied Sciences, Institute for Optofluidics and Nanophotonics (IONAS), Karlsruhe, Germany; [2]Nano Structuring Center, Forschungszentrum OPTIMAS, Technische Universität Kaiserslautern, Kaiserslautern, Germany; [3]RMIT University, School of Electrical and Computer Engineering, Microplatforms Research Group, Melbourne, Australia
Air-suspended polymer grating couplers were fabricated by transferring SU-8 layers onto KMPR air cavities using a structured PDMS stamp. We report on the fabrication and characterization of a resulting optofluidic refractive index sensor that is probing an analyte transported in a micro-channel below the grating coupler.

9:45 Light-driven microfluidics with a MOEMS based laser scanner 27

Marcus Baumgart, Andreas Tortschanoff, Diana Damian, Matthias P. Kremer
CTR Carinthian Tech Research AG, Austria
Using a compact MOEMS based laser scanner device, thermal flows were induced in a microfluidic environment enabling the manipulation of polystyrene beads in an unstructured microfluidic chamber. In our paper we present the scanner device and show experimental results.

10:00-10:30 COFFEE BREAK

10:30– 12:00 Fundamental Optofluidics 2

Location: Room 22, 2nd Floor, Congress Centre

Invited Talk **10:30 Selective optofluidic manipulation of chiral particles** 29

Georgiy Tkachenko, Artur Aleksanyan, Etienne Brasselet
University of Bordeaux, CNRS, France
The interplay between the chirality of matter and light allows considering several options to manipulate, in a selective manner, both positional and angular mechanical degrees of freedom of chiral objects depending on their chirality. This is illustrated experimentally by using the helicity of light as a control parameter.

11:00 Interaction of laser beams with single droplets in pendant position 31

Mihail Lucian Pascu[1], Ionut Relu Andrei[1], Mihai Boni[1], Viorel Nastasa[1], Ruxandra Pirvulescu[2]
[1]National Institute for Lasers,Plasma and Radiation Physics, Romania; [2]Faculty of Medicine, University of Medicine and Pharmacy Carol Davila, Bucharest, Romania
Results are shown about the unresonant interaction of a single laser pulse at 532 nm with a droplet of water or ethyl alcohol, DCM, DCM mixed with ethyl alcohol, DMSO, DCM mixed with DMSO, Rhodamine 6G solution in ethyl alcohol. The effects produced on a droplet of Rhodamine 6G solution in ethyl alcohol at resonant interaction with a laser beam emitted at 532 nm are also presented.

11:15 A holographic tracking method for characterization of microfluidic particles flow 33

Pasquale Memmolo[1,2], David Dannhauser[1], Domenico Rossi[1], Francesco Merola[2], Lisa Miccio[2], Filippo Causa[1], Pietro Ferraro[2], Paolo Antonio Netti[1,3]
[1]Center for Advanced Biomaterials for Healthcare@CRIB, Istituto Italiano di Tecnologia, Italy.; [2]CNR-Istituto di Cibernetica "E. Caianiello", Italy; [3]Dipartimento di Ingegneria Chimica, dei Materiali e della Produzione Industriale, University of Naples, Italy
A new holographic tracking method, able to calculate simultaneously and in a single step, all the spatial coordinates of particles flowing in a microfluidic channel is presented. The experiments are performed on a microfluidic-induced particle migration.

11:30 Resonant interaction of laser beams with pendant droplets of emulsions 35

Mihai Boni[1,2], Viorel Nastasa[1], Ionut Relu Andrei[1], Angela Staicu[1], Mihail Lucian Pascu[1,2]
[1]National Institute for Laser, Plasma and Radiation Physics, Romania; [2]Faculty of Physics, University of Bucharest, Romania
In this paper are shown results about resonant interaction of laser beams with pendant droplets containing emulsion of Rhodamine 6G (Rh6G) solution in water with oily Vitamin A. We studied the fluorescence emission, by varying different parameters such as: volume of the pendant droplet, dimension of the oil droplets in the emulsion, dye concentration in water solution, energy of the pumping beam.

11:45 Low-cost polymer guided mode resonance filters for sensing applications 37

Pétur Gordon Hermannsson[1], Christoph Vannahme[1], Kristian T. Sørensen[1], Jan J. Klein[2], Cameron L.C. Smith[1], Maria-Melanie Russew[2], Gabi Grützner[2], Anders Kristensen[1]
[1]Technical University of Denmark, Denmark; [2]micro resist technology, Germany
We present an inexpensive, all-polymer guided mode resonance filter fabricated by means of a vacuum-less process, using UV nanoreplication and spin-coating, The structure exhibits state-of-the-art sharp resonant reflection with a FWHM of 3.8 nm and a sensitivity of 60 nm/RIU for media with refractive indices around that of water. These polymer devices are more suitable for high throughput industrial production than more traditional titanium dioxide based devices, and thus well suited for single-use biological and refractive index sensing.

12:00-14:00 LUNCH BREAK

14:00– 15:00 Fundamental Optofluidics 3

Location: Room 22, 2nd Floor, Congress Centre
Session Chair: David Sinton

14:00 One Specific Velocity Mapping in Optical Coherence Tomography 39

Anton Yurievich Poltov, Sergey Vyacheslavovich Sindeev, Sergey Vladimirovich Frolov, Sergey Gennadievich Proskurin
Tambov State Technical University, Russian Federation
The method of sign-sensitive mapping of one specific velocity (OSV) in a flow with complex geometry based on the principles of optical coherence tomography (OCT) is described. The mapping is controlled using two parameters, the value of velocity, V, and the accuracy of its determination, ΔV. Structural image and two OSV images (for positive and negative direction of motion) are obtained as a result of selecting and processing the relevant parts of the signal spectrum. The final image is a result of complexing these three and can be used as a Doppler equivelocity color map.

14:15 Frequency pulling of optically rotating spheroidal oblate particles 41

Petr Jákl[1], Alejandro Vásquez Arzola[2], Stephen Simpson[1], Lukáš Chvátal[1], Pavel Zemánek[1]
[1]ASCR, Institute of Scientific Instruments, Czech Republic; [2]Instituto de Física, Universidad Nacional Autónoma de Mexico, México
Dielectric oblate particles trapped in an optical vortex exhibit circulating motion where the angular frequency depends on the properties of the particle and parameters of the vortex beam. The hydrodynamical interaction between two rotors in vicinity causes angular frequency pulling that we studied under different experimental conditions.

14:30 Optofluidic 3D hydrogel particle fabrication by gravity and inertia assisted flow shaping 43

Kevin S. Paulsen, Aram J. Chung
Rensselaer Polytechnic Institute, United States of America
We present a novel method of creating 3D hydrogel particles by fluid and light shaping. Fluid inertia and gravity are used to deterministically shape fluid streams, which are then exposed to patterned UV light to create complex 3D hydrogel particles. By varying light and flow conditions, an infinite set of shapes is available.

14:45-15:00 Integration Aspects of Solar-Hydrogen Generators 45

Miguel Antonio Modestino, Claudia Alejandra Rodriguez, Christophe Moser, Demetri Psaltis
School of Engineering, EPFL, Switzerland
Integrated optofluidic devices that generate Hydrogen (H2) from sunlight have the potential to lead to viable sources of clean fuels. Here we analyze the underlying factors that drive the H2 production cost in solar-fuel devices, and describe the design space and degree of integration that can result in cost-effective solar-H2 generators.

15:30– 16:00 COFFEE BREAK

16:00– 17:30 Handheld Devices

Location: Room 22, 2nd Floor, Congress Centre
Session Chair: Anders Kristensen

Invited Talk **16:00 Democratization of Next-Generation Imaging, Sensing and Diagnostics Tools through Computational Photonics** 47

Aydogan Ozcan
UCLA, United States of America
In this presentation I will discuss some of the emerging applications and the future opportunities and challenges created by the use of mobile phones and other consumer electronics devices as well as their embedded components for the development of next-generation imaging, sensing, and diagnostics tools through computational photonics techniques.

Invited Talk **16:30 Phase conjugate focusing of light onto moving target in a random medium** 49

Changhuei Yang
California Institute of Technology, United States of America
I will discuss our recent work on the use of digital optical phase conjugation to focus light on a moving target within a random medium. This method employs the information inherent within the scattered speckle patterns to provide the appropriate wavefront solution. This work can potentially be applied to perform in vivo flow cytometry on contents within a blood vessel.

Invited Talk **17:00 Optofluidics: Photonic Technologies for Mobile and Global Health** 50

David Erickson
Cornell, United States of America
Smartphones and other mobile technologies will be transformative to the deployment of molecular diagnostics both domestically and worldwide. In this talk, I will review the existing commercial and technical roadblocks to the deployment molecular diagnostics to the consumer market and how they can be fundamentally altered by taking advantage of the now ubiquitous installed base of smartphones. In addition to covering the basic engineering science advancements that led to the development of these technologies, I will also discuss our strategies for deployment and commercialization.

17:30– 20:00 EOSOF Poster Session

Location: Hall B0, Ground Floor, Congress Centre

POSTERS

Development of a Micro-optofluidic Temperature Sensor 51

Manoj Kumar Sharma[1], Arjan Frijns[2], Toni Janssen[3], Rajesh Mandamparambil[4], David Smeulders[5]
[1]Eindhoven University of Technology, Netherlands; [2]Eindhoven University of Technology, Netherlands; [3]Eindhoven University of Technology, Netherlands; [4]TNO, Eindhoven, Netherlands; [5]Eindhoven University of Technology, Netherlands
A fluorescent micro-optofluidic temperature sensor is developed using a temperature sensitive dye. The sensor can measure temperatures in microregions up to 70 °C and is applicable in lab-on-a chip devices. It is fabricated using soft lithography method and uses Rhodamine B dissolved in water as a temperature indicator.

Micro-fluidic chip for cell sorting 53

Mojmír Šerý, Zdeněk Pilát, Jan Ježek, Jan Kaňka, Pavel Zemánek
Institute of Scientific Instruments of the ASCR, v. v. i., Czech Republic
We demonstrate micro-fluidic platform specially designed for optical sorting of cells. The deep reactive ion etching technique is used to manufacture bio-compatible chips on glass type substrates. Micro-fluidic chip was incorporated into our active optical sorting system with Raman signal detection to prove of vitality of the cells.

Optical measurement of temperature modification induced by infrared light exposure 55

David Moreau, Claire Lefort, Philippe Leveque, Rodney P. O'Connor
Xlim research institute, France
The work presented here attempts to describe an optical method of temperature measurement in various materials under infrared laser excitation using Rhodamine B fluorescent dye. The temporal precision of this method is of the order of few milliseconds. The use of an optical fiber allows the access to different regions of the material.

On-site three-dimensional fabrication of organic optical system with micro-dispensing method 57

Mitsuhiro Nakano, Noboru Hirakawa, Hiroaki Yoshioka, Yuji Oki
Kyusyu-University, Japan

Fabrication technique based on "micro-dispensing method" have been developed for fully polymeric optical micro 3D system with additive manufacturing scheme. The technique provides polymeric optical system that contains microwire microridge, micro-bottle, and spindle-shaped microrod that mounted in high-precision control. Ultra-fine polymer microwire array successfully bridged in diameter of 1.0~1.5 μm. In addition, spindle shaped microrod was fabricated by irradiating a focused laser beam (1064 nm) . We have succeeded in the stacking prepolymer vertically. The rod diameter was approximately 40 μm, and maximum height of 100 μm was obtained.

Tapered optical waveguide based on liquid core/liquid cladding optofluidic waveguide 59

Mohammadreza Oraie[1,2], Hamid Latifi[1,2], Jalal Sadeghi[2], Hamed Nikbakht[2]
[1]Physics Department, Shahid Beheshti University, Iran; [2]Laser and Plasma Research Institute, Shahid Beheshti University, Iran

In this paper, we focus on the possibility of forming a tapered optical waveguide based on liquid core/liquid cladding waveguides. We perform 2D simulations based on incompressible Navier Stokes equations and examine the possibility of forming a tapered optofluidic waveguide.

Polarimetric refractive index sensitivity of a side-hole optical fiber as an optofluidic channel 61

Jalal Sadeghi[1], Hamid Latifi[1,2], Mohammadreza Oraie[1,2], Farnood Mirkhosravi[1], Michal Murawski[3]
[1]Laser and Plasma Research Institute, Shahid Beheshti University, Iran; [2]Department of Physics, Shahid Beheshti University; [3]Inphotech Ltd. Slominskiego 17/31 Warsaw and Military University of Technology, Poland

In this letter, we present a theoretical analysis of a microfluidic fiber device, with an emphasis on the polarimetric analyzing of the wave guidance of a side-hole fiber microchannel. We found that by using one of the two side-holes as a microfluidic channel, the polarimetric refractive index sensitivity is enhanced.

Model studies of blood flow for cerebral aneurysms prediction using 3D LDA 63

Sergey Vladimirovich Frolov[1], Tatyana Anatolievna Frolova[1], Sergey Vyacheslavovich Sindeev[1], Dieter Liepsch[2], Andrea Balasso[3], Sergey Gennadievich Proskurin[1], Anton Yurievich Potlov[1]
[1]Tambov State Technical University, Russian Federation; [2]Munich University of Applied Sciences, Germany; [3]Technical University of Munich, Germany

It is proposed an integrated approach to the study of blood flow using 3D LDA for identifying the causes of genesis of cerebral aneurysms. Feature of the work is the combined usage of both mathematical modeling and experimental methods. Proposed an integrated approach using both experimental and numerical methods of research to identify the causes of the cerebral aneurysms development.

Lithium niobate crystals for opto-microfluidic sensors 65

Cinzia Sada[1], Giacomo Bettella[1], Gianluca Pozza[1], Annamaria Zaltron[1], Mathieu Chauvet[2], Blandine Guichardaz[2]
[1]University of Padova, Physics and Astronomy Department, Padova, Italy; [2]FEMTO-ST institute, UMR CNRS 6174, University of Franche-Comté, Besançon, France

In micro-analytical chemistry and biology, the realization of lab-on-chip systems with higher levels of integration of different stages on the same platform is constantly addressed. The recent results on the integration of a microfluidic circuit with optical waveguides will be presented, addressing to the potential realization of optical sensing platforms in a lab-on-chip system entirely based on LiNbO3 substrate.

Optical fiber probes with integrated nanostructured micro-optics for optofluidic applications 67

Bernard Piechal[1], Adam Filipkowski[1,2], Dariusz Pysz[1], Ryszard Stępień[1], Andrew Waddie[3], Ryszard Buczyński[1,3], Mohammad Taghizadeh[3]
[1]Institute of Electronic Materials Technology, Poland; [2]Heriot-Watt University, UK; [3]Warsaw University, Poland

We present the integrated optical fiber probe for optifluidic studies. It is based on single mode optical fiber with the nanostructured micro-axicon integrated on its end. The probe produces non diffracting beam at the distance of 50 um from the surface of the probe.

Optofluidic waveguides in hydrophobic aerogels formed by femtosecond laser ablation 69

Berna Yalizay[1], Yagiz Morova[1], Koray Dincer[1], Yaprak Ozbakir[2], Alexandr Jonas[1], Can Erkey[2], Alper Kiraz[2], Selcuk Akturk[1]
[1]Istanbul Technical University, Turkey; [2]Koc University, Turkey

Silica aerogels are distinctive nano porous materials which have extremely low refractive index, high surface area to volume ratio and optical transparency. These properties make silica aerogels very interesting for optical applications like optofluidic waveguides. However, it is very hard to process aerogels with common mechanical methods like cutting, milling or drilling. In this study, we were able to form high quality cylindirical microchannels inside hydrophobic silica aerogels with direct femtosecond laser pulses. We demonstrate waveguiding in the ethylene glycol filled microchannels, with an optical loss of 9.9 dB/cm.