



Next Generation Autonomous Analytical Platforms for Remote Environmental Monitoring: Generation of Fully Functioning Biomimetic Analytical Platform for Water Quality

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ATWARM

ATWARM Meeting
Belfast, Nov 2011



Presentation Outline

- Introduction
- Background
- Preliminary results: Water Quality Sensor
 - pH
 - turbidity
- Outputs and additional training



Background



Background



Background

West Pomeranian University of Technology



Faculty of Mechanical Engineering and Mechatronics



- *Master of Science* degree in Materials Engineering (2005 - 2010)

“Evaluation of fatigue properties of elastomers for the elements of an artificial heart”



Background

Dublin City University National Centre for Sensor Research



- Marie Curie Initial Training Network ATWARM Research program
(Oct 2010 - Sept 2013)

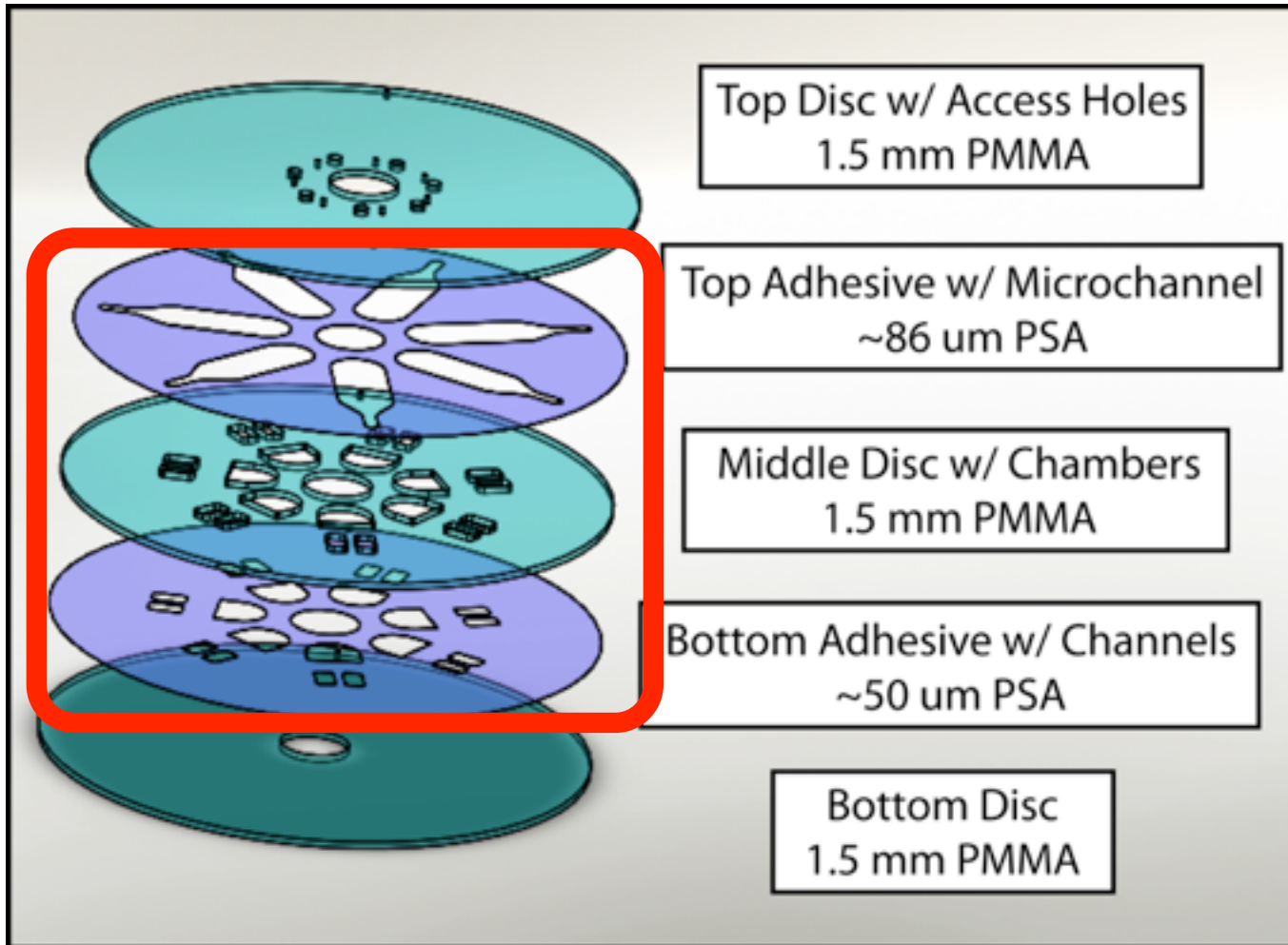
“Generation of Fully Functioning Biomimetic Analytical Platform for Water Quality”



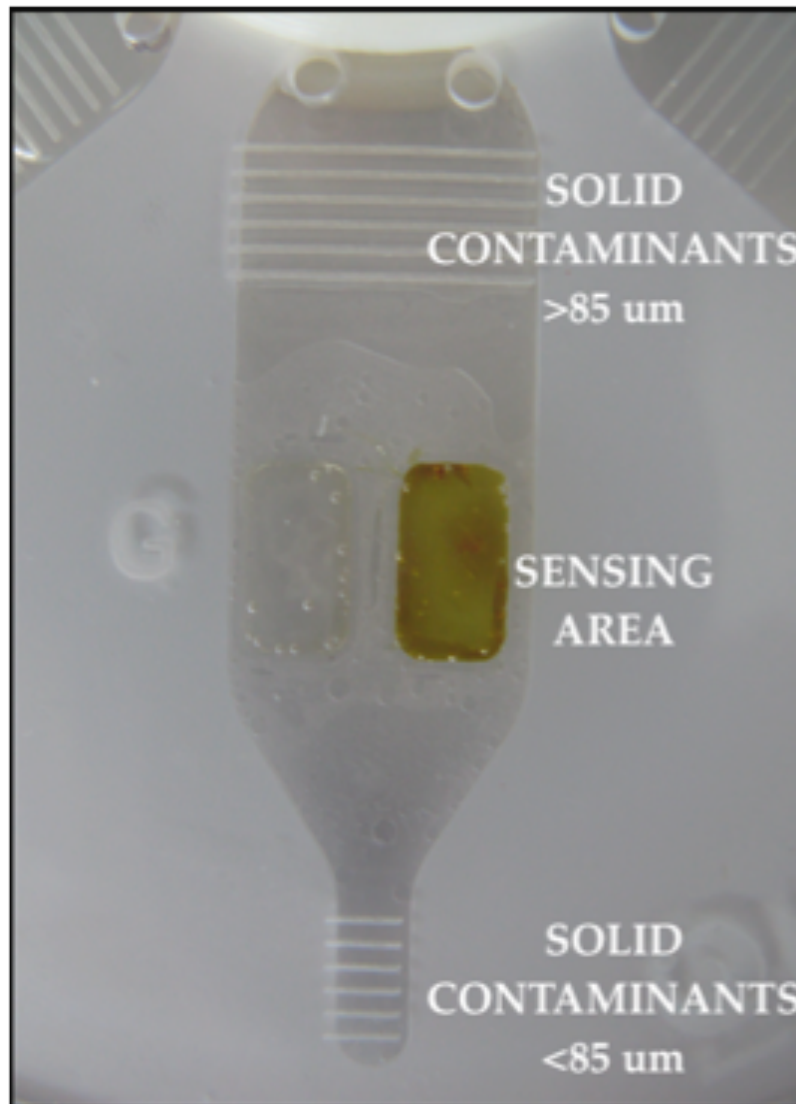
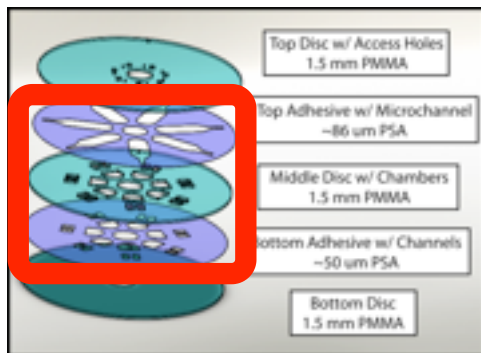
<http://ec.europa.eu/euraxess/>



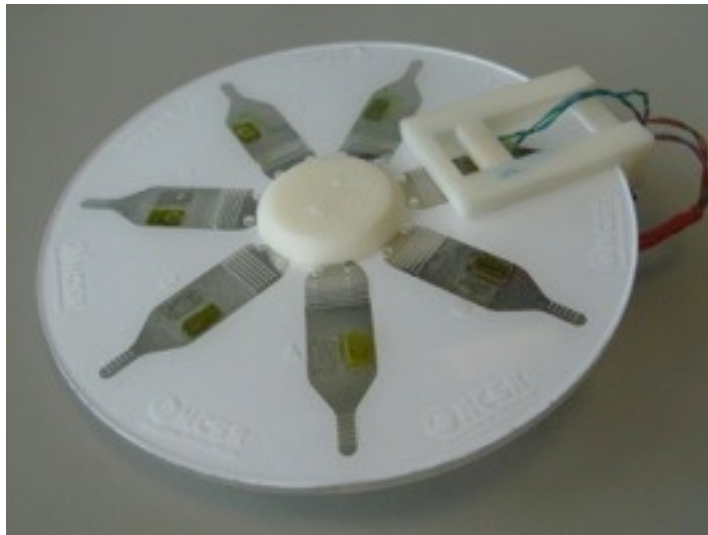
Our Sensor: Lab-on-a-Disc



Our Sensor: Lab-on-a-Disc



Our Sensor: Lab-on-a-Disc



XBee RF
Module

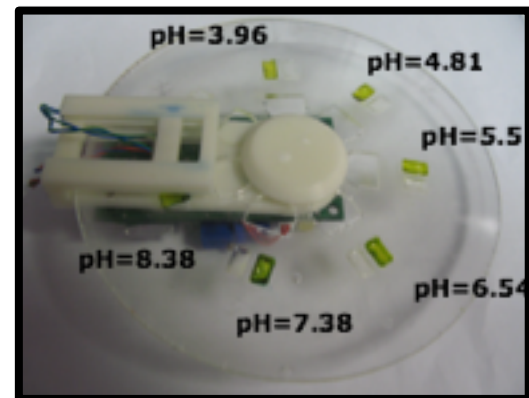
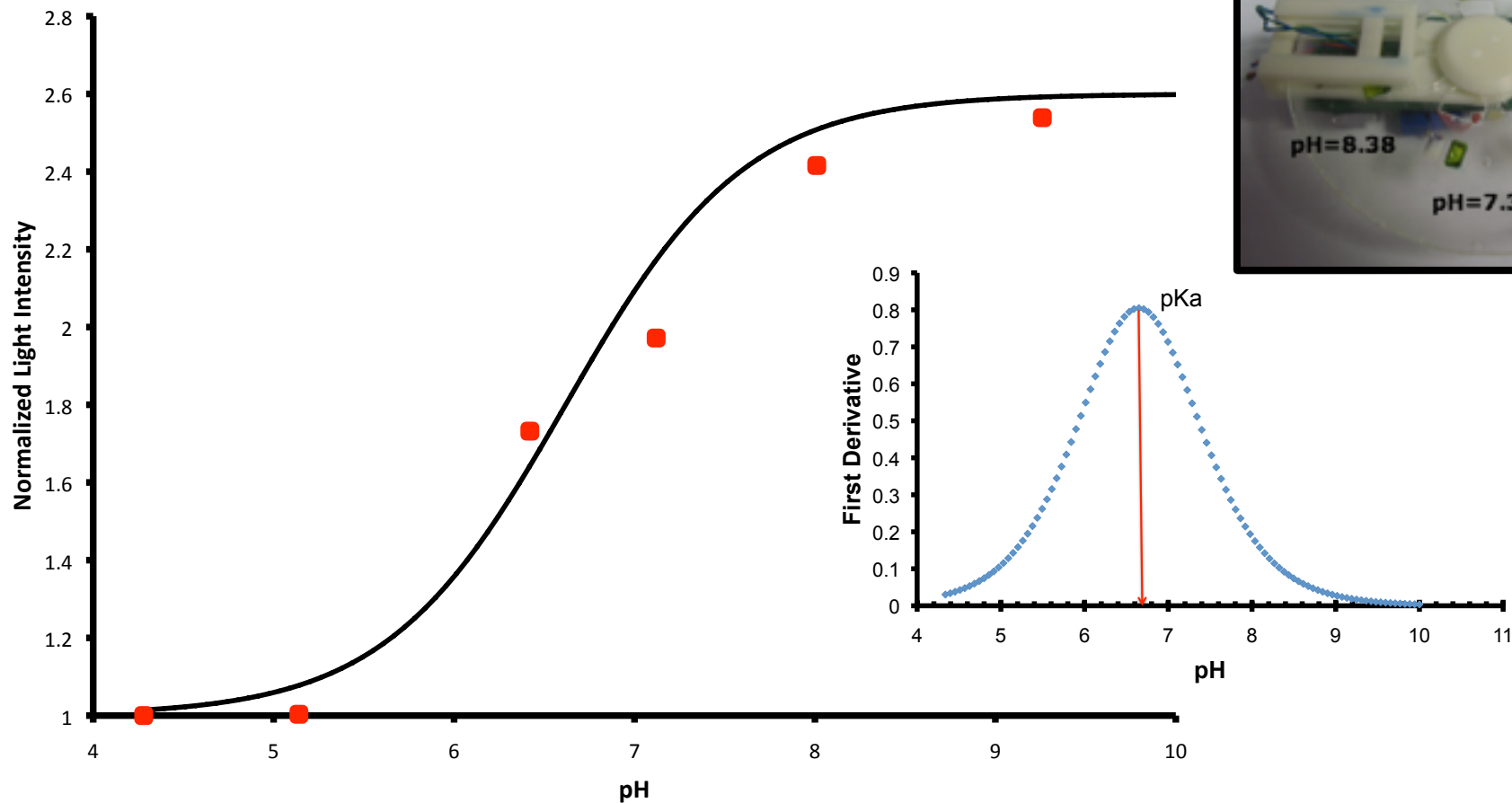
Battery

Arduino Fio
microcontroller

PEDD



Calibration of the sensor



Ionogel $pK_a = 6.6$

Bromocresol Purple $pK_a = 6.3$



On-Chip Water Analysis



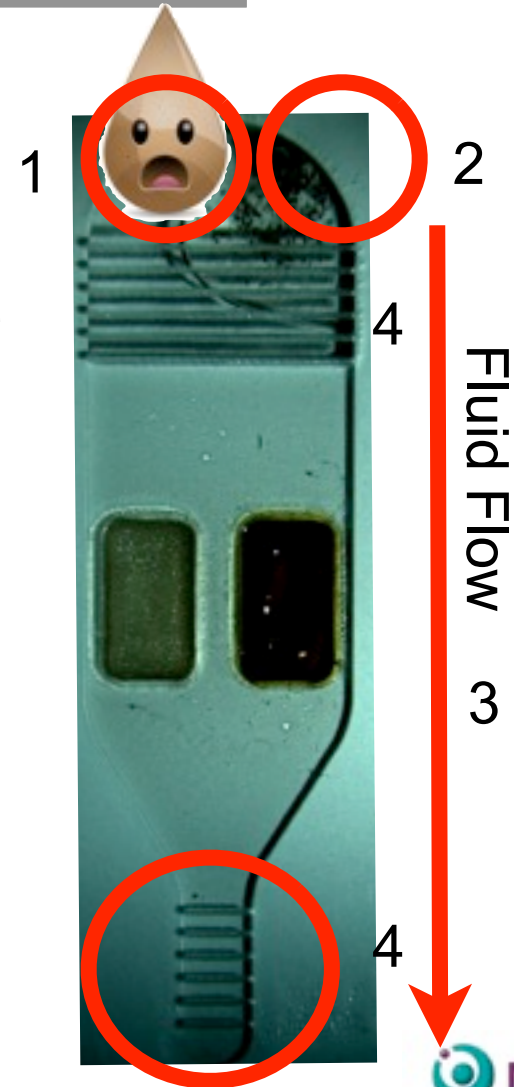
Map of the river Tolka and the sampling points (red dots).



On-Chip Water Analysis



Map of the river Tolka and the sampling points (red dots).



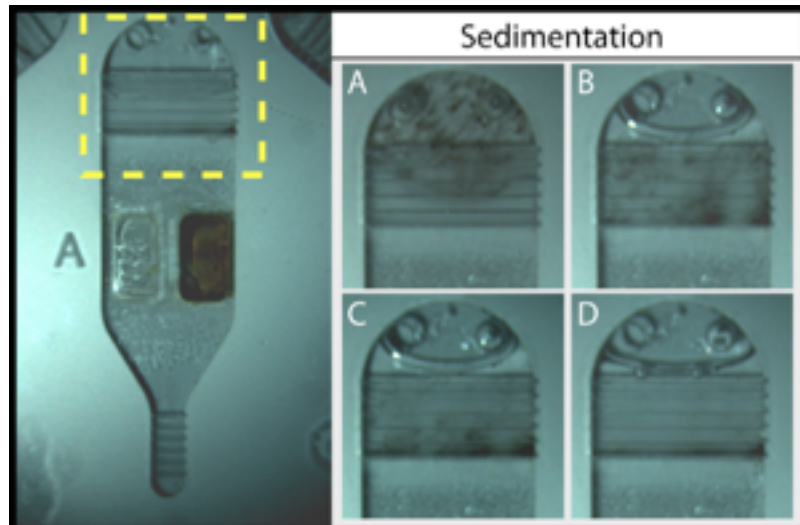
On-Chip Water Analysis



Map of the river Tolka and the sampling points (red dots).

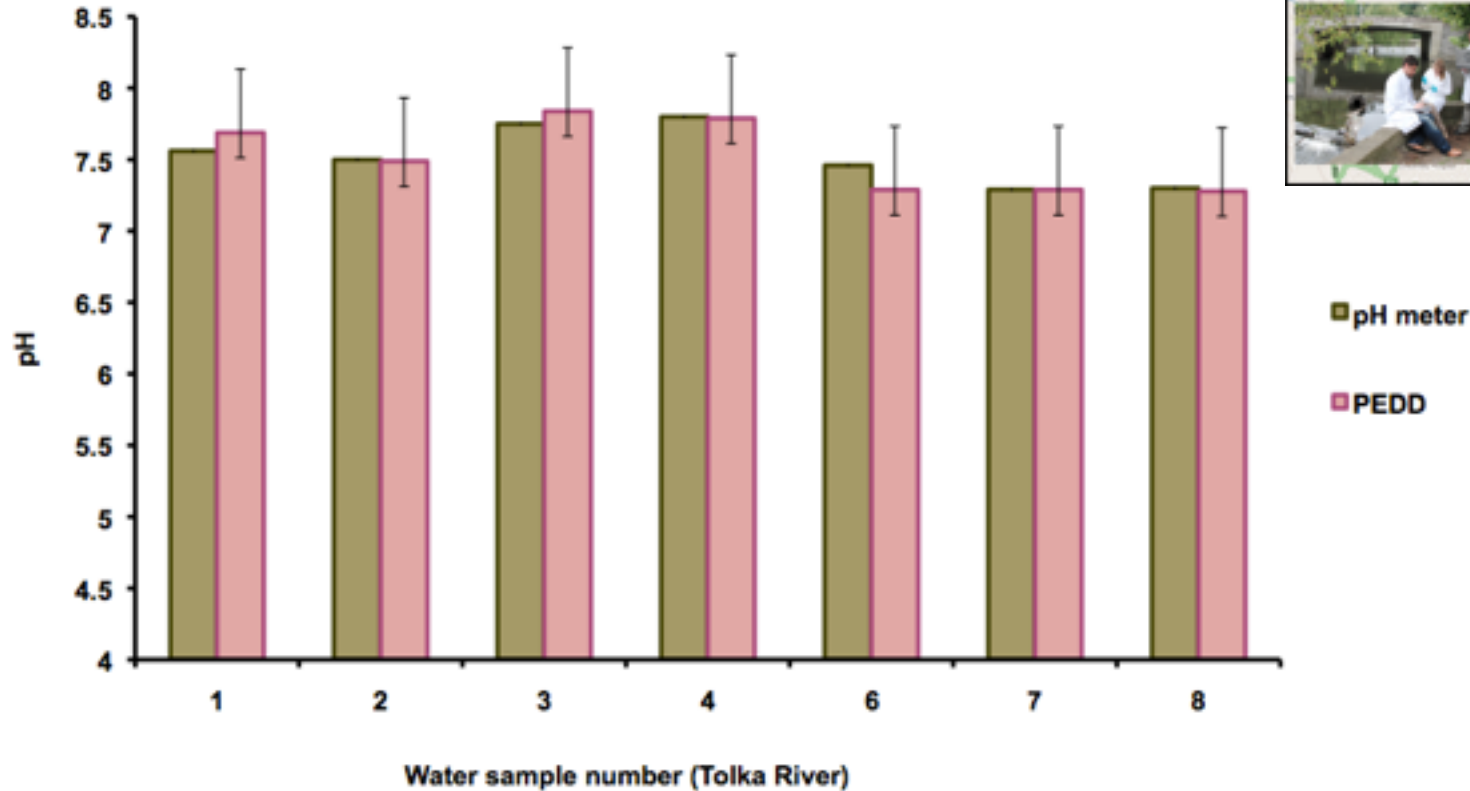


CD-chip during centrifugation at 1500 rpm.



On-Chip Water Analysis: pH

Water pH analysis using a commercially available pH-meter and the PEDD lab-on-a-disc device (error n=3)



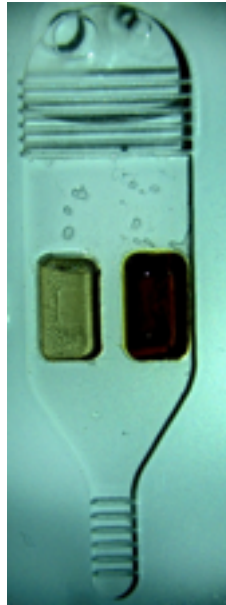
On-Chip Water Analysis: Turbidity

High Turbidity
SAMPLE
(No. 3)

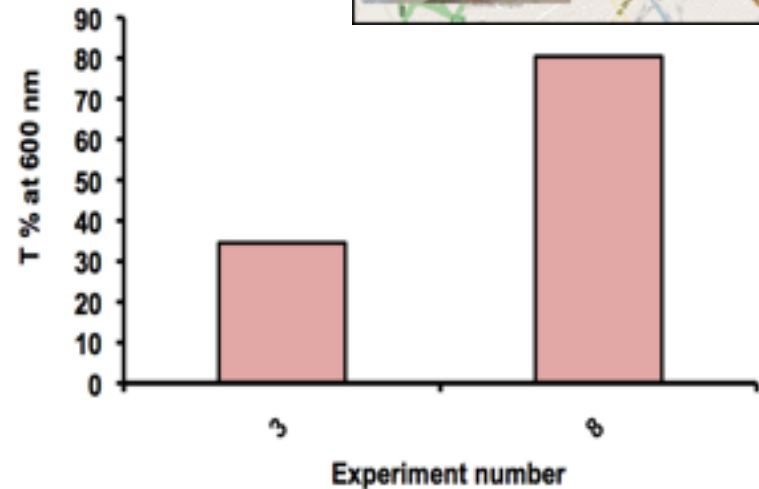


CD: pH 7.83
Meter: pH 7.75

Low Turbidity
SAMPLE
(No. 8)



CD: pH 7.27
Meter: pH 7.3



UV-VIS spectrometer (transmittance)



Scientific visits and seminars

- **Seminar**, University California Berkeley, 10 October, 2011, California, USA, (INVITED TALK)
- **Seminar**, Universitat Autònoma de Barcelona, 16 Sept 2011, Barcelona, Spain (INVITED TALK)
- Scientific visit to Instituto de Microelectrónica de Barcelona (CNM-IMB): 5-16 Sept 2011, Barcelona, Spain
- Scientific visit to Fraunhofer-Institut für Physikalische Messtechnik: 13 May 2011, Freiburg, Germany

Conferences

- **MicroTAS**, The 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences, 2-6 Oct 2011, Seattle, USA (ORAL)
- **Marie Curie Researchers Symposium**, SCIENCE – Passion, Mission, Responsibilities, Polish Presidency of the EU Council 25-27 Sept 2011, Warsaw, Poland (POSTER)
- **SPIE-2011**, Nanoscience + Engineering, 21 - 25 August, 2011, San Diego, California, USA, (INVITED TALK)
- **Transducers 2011 Conference**, The 16th International Conference on Solid-State Sensors, Actuators and Microsystems, 5-9 June 2011, Beijing, China (ORAL)



Publications

- The Key to Revolutionary Breakthroughs in Micro-fluidic Devices, Proceedings SPIE 8107, 81070C, 2011; doi:10.1117/12.895330 (REVIEW PAPER)
- Photo-actuated Ionogel Microvalves for Real-time Water Quality Analysis in a Micro-fluidic Device, Journal of Materials Science (in preparation)
- Novel optical sensing system based on wireless paired emitter detector diode device for Lab-on-a-Disc water quality measurements, Lab Chip (in preparation)

Short Courses

- **Short course:** Lab-on-a-chip technologies for applications in the life sciences, Transducers 2011 Conference, 5-9 June 2011, Beijing, China.
- **Short course:** Microfluidics: Device Science and Technology; Transducers 2011 Conference, 5-9 June 2011, Beijing, China.



Acknowledgements



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Thank You for Your Attention!

