ATWARM

Advanced Technologies for Water Resource Management

Next Generation Autonomous Analytical Platforms for Remote Environmental Monitoring

Generation of Fully Functioning Biomimetic Analytical Platforms for Water Quality

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Project Objectives:

- **Integration of actuators into a microfluidic platform:**
  - biomimetic structures with detectors
  - fluidic manifolds
  - integral reagent addition and calibration standards
  - integral electronics
  - communications and power generation/storage
- **Demonstration of fully functioning analytical platform.**

Wireless Paired Emitter Diode Device as Optical Sensor for Lab-on-a-Disc Water Analysis - *Introduction*

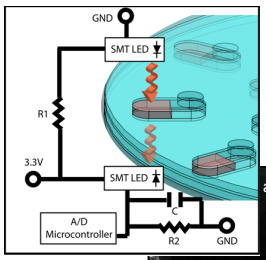

Fig 1. The schematic of circuit used in the system.

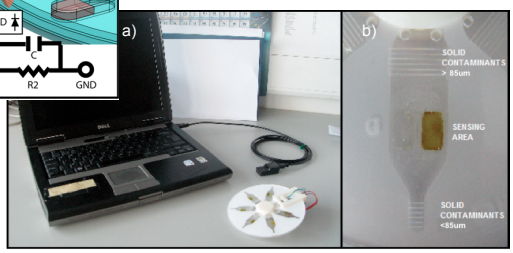

Fig 2. a) Prototype of the PEDD centrifugal micro-fluidic system, b) channel consisting of three chambers. [1]

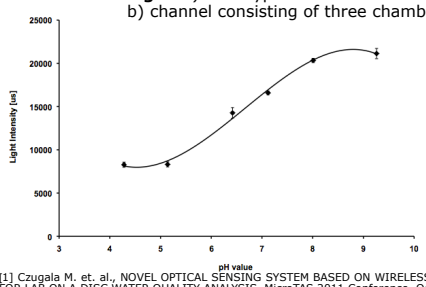

Fig 3. Calibration curve of the sensing area of the microfluidic device using pH buffer solutions. (n=70, error represents the average of light intensity values during data collection).

[1] Czugala M. et. al., NOVEL OPTICAL SENSING SYSTEM BASED ON WIRELESS PAIRED EMITTER DETECTOR DEVICE FOR LAB ON A DISC WATER QUALITY ANALYSIS, MicroTAS 2011 Conference, October 2-6, 2011, Seattle, USA.

Results

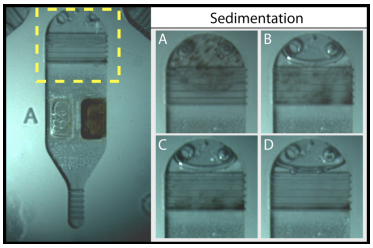

Fig 4. Images of a channel of the CD-chip during centrifugation at 1500 rpm. A) the upper chamber is filled with sample, then the disc is spun and all the liquid is transferred to the sensing area (B-D). Solid contents are accumulated in the first chamber (>85µm diameter) (B-D) and at the bottom of the channel (<85µm diameter).

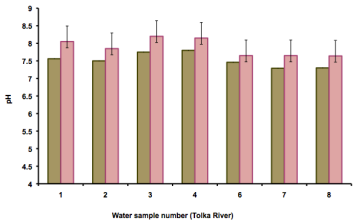

Figure 5. Water pH analysis using a commercially available pH-meter and the PEDD lab-on-a-disc device.

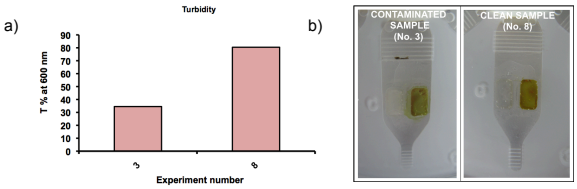

Figure 6: a) Turbidity measurements using a UV-VIS spectrometer (transmittance) and b) two channels with river samples; one contents solids in the upper chamber (left) while the other is clean (right).

Conferences

- M. Czugala, R. Gorkin, C. Rovira-Borras, J. Ducree, D. Diamond, F. Benito-Lopez, ***Microfluidic system with a wireless paired detector diode device as an optical sensor for water quality monitoring***, Conference on Analytical Sciences Ireland 2011, February 21-22, 2011, Dublin, Ireland. *Submitted (POSTER).*
- R. Gorkin, M. Czugala, C. Rovira-Borras, J. Ducree, D. Diamond, F. Benito-Lopez, ***A Wireless Paired Emitter Detector Diode Device as Optical Sensor for Lab-On-A-Disc Applications***, The 16th International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers-2011), June 5-9, 2011, Beijing, China. *(POSTER).*

ANTICIPATED CONFERENCES:

- M. Czugala, R. Gorkin, T. Phelan, J. Ducree, D. Diamond, F. Benito-Lopez, ***Novel Optical Sensing System Based on Wireless Paired Emitter Detector Diode Device for Lab-on-a-Disc Water Quality Analysis***, The 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), October 2-6, 2011, Seattle, USA. *(ORAL)*

Marie Curie Initial Training Network