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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Introduction
Nowadays, there is great interest in in-situ monitoring allowing fast data acquisition for environmental analysis. The challenge is to develop autonomous devices that could be used in remote locations, which would ultimately enable dynamic monitoring. Typical analysis methods are very costly and time consuming, therefore addressing the need for a simple and cost-effective sensor is crucial. Here we present the design and the development of a portable wireless centrifugal microfluidic analysis system (CMAS) for a lab-on-a-disc water quality monitoring. The micro-fluidic platform enables in situ nitrite detection of real water samples.

Centrifugal Microfluidics Analysis System (CMAS)

![Image of CMAS system with CD microfluidic in it](Fig. 1)

**Fig. 1.** Picture of the CMAS with a CD microfluidic in it (left), and the centrifugal microfluidic analysis system major components (right).

![Image of portable centrifugal microfluidic analysis system](Fig. 2)

**Fig. 2.** Portable centrifugal microfluidic analysis system (left), and configuration of the paired LEDs for the alignment of the CD and the colorimetric analysis.

CD platform

![Image of CD platform](Fig. 3)

**Fig. 3.** a) Scheme showing the assembly of the micro-fluidic CD, b) picture of the Lab-on-a-Disc and channel consisting of three chambers and c) a zoom on a single chip consisting of three chambers.

Results

![Image of results](Fig. 4)

**Fig. 4.** Kinetic study of the colour formation monitored at a wavelength \(\lambda_{max} = 540\) nm between NO\(_2\) and Griess reagent (\(n = 3\)) (left side) and absorbance versus nitrite Griess reagent complex concentration (right side) using a UV-Vis spectrometer (a) and the CMAS system (b).

Conclusions

The autonomous capabilities of the CMAS unit, combined with the portability and wireless communication, provide the flexibility needed for on-site water analysis. Apart from the fact that acquisition parameters can be controlled remotely and adjusted according to individual needs, results can be downloaded in remote locations and displayed in real time. The system demonstrates the potential of a truly autonomous micro-fluidic platform for aquatic environmental analysis.

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