IWAO-based compact analyser

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Integrated Waveguide Absorbance Optodes (IWAOs) have been recently proposed by our research group [1] as a general optosensing platform, which exploits the technological improvements attained by the microelectronic and telecommunication industries. This fabrication methodology allows an automated mass fabrication of optical sensors with enhanced sensibility, short response time and easy exchangeability. Such devices consist of bulk optodes, which are deposited over a microfabricated planar waveguide circuit constructed by IC technology. The membranes work as the selective recognition region while acting as part of the light guiding planar structure.

We report a novel compact instrumental set-up for an optochemical analyser, the innovation of which is the introduction of a reference wavelength (λ_2=850 nm)) into the optical sensor, along with the sensing wavelength (λ_1=780 nm). The reference one is located out of the main absorption peak of the dye, thus providing a signal that depends only on physical changes of the system (such as fibre bending, membrane hydration or refractive index changes). It can be used to correct the output signal of the sensor, avoiding new calibrations, by removing the changes in absorbance due to causes other than variations on the analyte concentration.

To demonstrate the feasibility of the new measurement procedure, an IWAO has been activated with a calcium bulk optode and applied for the determination of calcium ion in water samples.

Moreover, a mercury-selective optode is currently being developed and optimised for the in field application of the miniaturized analyser in tap and industrial polluted water. Both optodes combine a previously synthesized and characterized ketocyanine dye [2] with a calcium ionophore or newly synthesized mercury ionophores. The absorbance maximum of the ketocyanine dye matches the wavelength of the working LED, provides a high capacity to differentiate between little concentration variations as a result of its high molar absorptivity and additionally, shows no absorption bands at the wavelength of the reference LED. The obtained results related to the chemical characterisation of the membrane and the analyser will be presented.

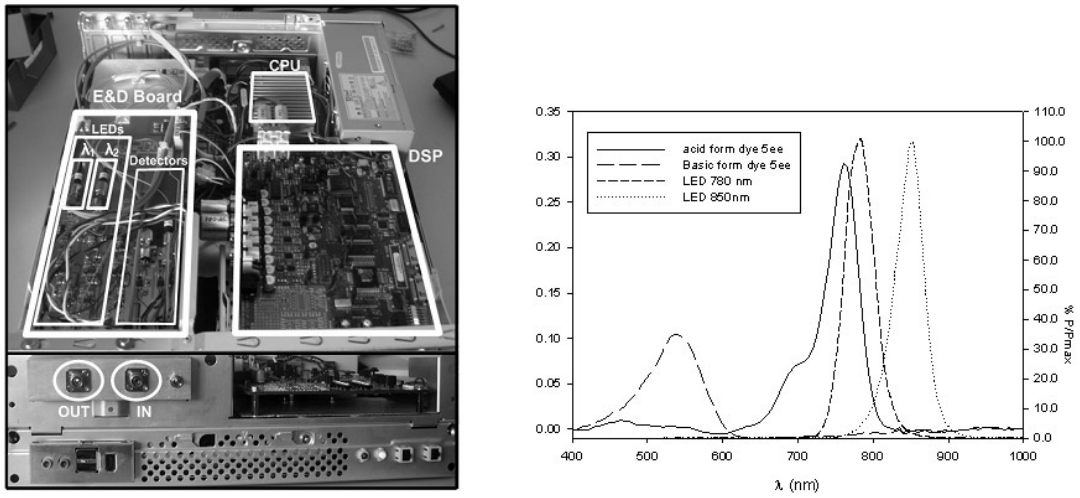

Fig 1. The compact optochemical analyser and localisation of the absorption bands of the dye and the emission LEDs.

[1] M. Puyol, I. Salinas, I. Garcés, F. Villuendas, A. Llobera, C. Domínguez, J. Alonso. *Analytical Chemistry*, **74** (2002) pp 3354-3361

[2] S. Miltsov, C. Encinas, J. Alonso. *Tetrahedron Letters*, **42** (2001) pp 6129-6131