A NEW LED-LED PORTABLE CO_2 GAS SENSOR BASED ON AN INTERCHANGEABLE MEMBRANE SYSTEM FOR INDUSTRIAL APPLICATIONS

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CO_2 monitoring is important for many areas of high economic relevance, like environmental monitoring, control of biotechnological processes in bio-pharmaceutical industries, and the food industry, particularly controlled atmosphere storage rooms and modified atmosphere packaging [1]. CO_2 sensing is not a trivial area of research, as is testified by the increasing numbers of publications regarding this topic over the past decade. The main reason is that CO_2 chemically is relatively unreactive, and therefore finding a mechanism for signal generation is difficult. Most publications are based on its well-known acidic properties.

In this communication, we present a portable optical sensor for gaseous CO_2 detection based on the phosphorescence intensity variation of a platinum octaethylporphyrin (PtOEP) complex trapped in oxygen-insensitive poly(vinylidene chloride-co-vinyl chloride) (PVCD) membranes. The sensing mechanism arises from the increasing displacement of the α-naphtholphthalein acid–base equilibrium with rising CO_2 concentrations [2]. The low-power LED-based optical sensing instrumentation for monitoring CO_2 is based on a pair of light emitting diodes (LEDs) arranged to face each other, wherein one LED functions as the light source and the other LED is reverse biased to function as a light detector [3]. A transparent polymer substrate coated on both sides with the CO_2 sensitive membrane placed between the two LEDs serves as a chemically responsive filter between the light source and the detector.

The response of the device to CO_2 (fig. 1) shows good sensitivity and linearity up to 20% CO_2, with the sensitivity decreasing above that.

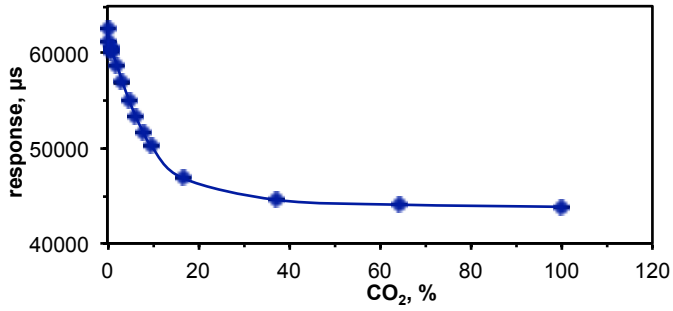

Figure 1: Response of the device up to 100% of CO_2 concentration using the LED-LED portable sensor.

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