

A NEW LED-LED PORTABLE SYSTEM FOR OXYGEN DETERMINATION

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Devices and sensors based on photo-excited state quenching of organic dyes and complexes for oxygen sensing are of common use in fields, such as environmental or clinical monitoring. We explore, in this communication, the paired emitter–detector diode (PEDD) technique along with the platinum octaethylporphyrin (PtOEP) chemistry [1] to develop a portable, low-power and cost optical system for O₂ detection. The system consists of two LEDs facing each other with an interchangeable support containing the PtOEP membrane in between.

We have tested this device in terms of sensitivity, short term and long term stability, dynamical behavior (Figure 1), temperature influence, and humidity influence. The calibration function was studied up to 30% of O₂ showing a good fit for the whole range ($r^2=0.9991$); a LOD of 0.01% was obtained. The short term stability was studied within one day, taking measurements each 15 minutes for 90 minutes showing a RSD of 0.54%. The long term stability was studied during 2 months, obtaining a RSD of 7.35%. Moreover, after two month, the membrane was still operative and we believe could be used for much longer. The response and recovery times obtained from the dynamical behavior study were 6.8 and 55 s, respectively. Temperature influence on the system was studied between 5 and 30 in order to avoid this dependence. The effect of the humidity was investigated, finding no influence on the response of the system. Finally, the drift of the measurements was studied by measuring at 21% of O₂ during 14 hours obtaining a RSD of 0.4%.

These results show the reliability of the system and their potential to develop a portable, low-power and cost LED-LED system capable of measuring O₂ and CO₂ [2] simultaneously.

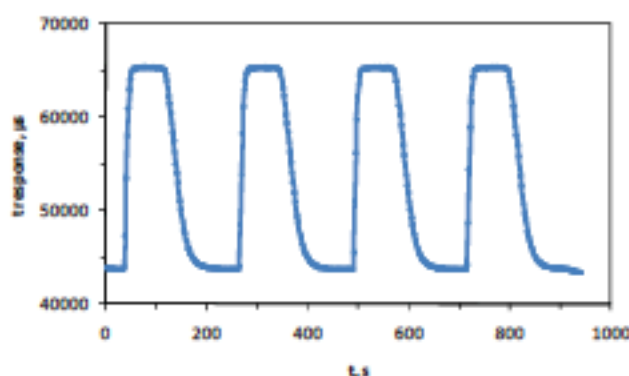


Figure 1. Dynamic behavior of the system

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[1] A. Martínez-Olmos¹, I.M. Pérez de Vargas-Sansalvador¹, A.J. Palma, J. Banqueri, M.D. Fernández-Ramos, L.F. Capitán-Vallvey, *Sens.Actuators B* 160 (2011) 52–58

[2] I.M. Pérez de Vargas-Sansalvador, C. Fay, T. Phelan, M.D. Fernández-Ramos, L.F. Capitán-Vallvey, D. Diamond, F. Benito-Lopez. *Anal. Chim. Acta* 699 (2011) 216-222