Sensitive layer based on lophine and calcium hydroxide for detection of dissolved oxygen in water

J.L. Camas-Anzueto, J.A. Gómez-Valdéz, R. Meza-Gordillo, M. Pérez-Patricio, H.R. Hernández de León, V. León-Orozco

PII: S0263-2241(15)00073-1
DOI: http://dx.doi.org/10.1016/j.measurement.2015.02.015
Reference: MEASUR 3260

To appear in: *Measurement*

Received Date: 22 November 2013
Revised Date: 8 December 2014
Accepted Date: 6 February 2015

Please cite this article as: J.L. Camas-Anzueto, J.A. Gómez-Valdéz, R. Meza-Gordillo, M. Pérez-Patricio, H.R. Hernández de León, V. León-Orozco, Sensitive layer based on lophine and calcium hydroxide for detection of dissolved oxygen in water, *Measurement* (2015), doi: http://dx.doi.org/10.1016/j.measurement.2015.02.015

Sensitive layer based on lophine and calcium hydroxide for detection of dissolved oxygen in water

*J.L. Camas-Anzueto[1], J.A. Gómez-Valdéz[1], R. Meza-Gordillo[2], M. Pérez-Patricio[1], H.R. Hernández de León[1], V. León-Orozco[1].

Departamento de Posgrado e Investigación, [1]Maestría en Ciencias en Ingeniería Mecatrónica, ITTG, Tuxtla Gutiérrez, Chiapas, México
Departamento de Posgrado e Investigación, [2]Maestría en Ciencias en Ingeniería Bioquímica, ITTG, Tuxtla Gutiérrez, Chiapas, México

*jcamas@ittg.edu.mx

Abstract:

In this paper, we present a new sensitive layer to detect dissolved oxygen in pure water. The sensitive layer was elaborated with Lophine and calcium hydroxide. It has identified two forms of measurement: a) the magnitude of optical absorbance, and b) the bathochromic shift of the absorption peak according to dissolved oxygen. The magnitude of the absorbance was related to the dissolved oxygen concentration in pure water successfully, and it was observed in the wavelength range from 400 to 1100 nm. This result allowed the measurement by using a photodetector for measuring the optical power as a function of dissolved oxygen. It was found that the sensitive layer had a peak absorption around 319 nm, and the bathochromic shift was 24 nm. The response and recovery time was 87 ms and 89 ms respectively, which is an advantage over conventional methods used so far.

Keywords: Dissolved oxygen, Sensitive layer, Optical detection

1. Introduction

Dissolved oxygen (DO) is a parameter needed to monitor water quality. This is because many chemical and biological reactions in water depend directly or indirectly on the amount of available oxygen. Also, aquatic life depends on DO concentration; for example, from 5 to 7 mg/l is acceptable for warm water fish, from 7 to 33.8 µm/l is very good for most stream fish including cold water fish. When the level in the water is below 5 mg/l it can harm aquatic life. On the other hand, a high DO level in a community water supply is good because it makes drinking water taste better. However, high DO levels speed up corrosion in water pipes. For this reason, it is necessary to monitor the DO in water, and the Winkler method is the most common method for measuring DO in water. Some authors have reported results applying this method [1-4]. Another proposal for measuring DO was a miniaturized sensor fabricated with silicon thin film technology; the response time of this sensor was 1 minute [5]. A micromachined wafer was attached onto the chip to form a compartment for the internal electrolyte, which is covered by a gas permeable membrane. Biotechnology application has been important in the measurement of DO. This has been observed in surface layer proteins as an immobilization matrix for oxygen sensitive dyes, and the characterization of both planar and fiber optic oxygen sensors was reported by Silvia R. Scheicher et al. [6]. For measurements with the planar oxygen sensor setup, the medium was equilibrated for 30 min to a final concentration of 0 mg/l oxygen and for 15