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Abstract

The technology we are developing consists of the use of coordination compounds with metals to carry out this detection of Acetic acid. This compound normally reacts with acetic acid changing its colour, making it a suitable compound for use as a detector. The proposed method allows detecting acetic acid in any medium, whether in solution, in the gas phase, in the solid phase, or in any combination of these. Upon contact with the acid, a colour change occurs that can be detected visually or through optical means. After its use, the active medium can be regenerated by a simple procedure and be available again for new use. This allows the creation of simple and intuitive detection devices, usable by non-experts and that can be regenerated and reused. The main advantage of this sensor is to allow the specific detection of acetic acid and quantification of its concentration, using coordination compounds with metals that are present in the yellow dye.

Design and development of an innovative and simple optical sensor for the detection of acetic acid

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INTRODUCTION

Optical materials is an essential science which is vital to numerous regions of the as healthcare, energy production and environmental monitoring.[1] Those materials are contributing in the in the Low-Cost sensors developing for the detection of specific pollutants, which is the case of our study, where we use coordination compounds with Metals, in the detection of acetic acid dispersed in the environment. This acid is one of common pollutant substances, that can be harmful not only for human health, but also for some art-works

So in our group, we are developing an simple intuitive, low-cost optical device that is able to detect this harmful acid

The sensor we are developing consist of five different parts:

1-An aluminum-heating base. On the left is the mosfettransistor that acts as a switch./
2-Power supply/3-TCS34725 RGB sensor.
/ 4-Arduino Uno with a Data Logger Shield. /
5-Interface I2C 16x2 LCD

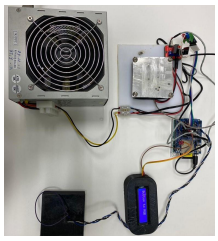

Figure 01: the sensor device

he optical sensor One line of work s based on the use of a specific ype of Schiff base because of its heir attractiveness as reagent for nalysis that raises the fact that it llowa simple and inexpensive eterminations of the acetic acid.

he Schiff base complexe of alladium dinuclear cyclometallated gands such as the one shown in igure 2, is synthesized by our roup. Where R1 is -Cl

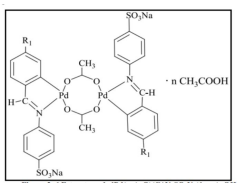

Figure 02: Palladium cyclometalated dinuclear complexes.

t has been found that they can associate with acetic acid in a reversible way with a noticeable color change from yellow to orange(figure3)

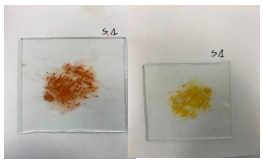

Figure 03: Orange to yellow color variation of the compound[Pd (μ-AcO) (C^N-SO3Na)]2after being subjected to 90ºC

METHODS

RGB values after the material/Acetic Acid reaction

Reactants and products	Conditions	RGB values
Yellow dye (reference value)	Subjected to 90ºC for 20min	R=114.53 /G=85.89 /B=49.21
Yellow dye+Ac solution =orange dye	Time contact=10min	R=121.96/ G=76.22 /B=54.05

Table 01:liquid acetic acid and yellow dye metrial reaction and results.

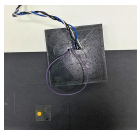

Figure 04: measurement of reference value

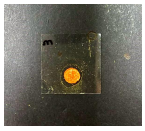

Figure 05: result of the liquid acetic acid / dye reaction

Reactants and products	Conditions	RGB values	Intensity (spectroph-otometer)
Yellow dye (reference value)	Subjected to 90ºC for 20min	R=114.53 G=85.89 B=49.21	6110.168
Yellow dye+ Ac gas =orange dye	Time contact=2 days	R=121.96 G=76.22 B=54.05	7001.421

Table 02:gas acetic acid and yellow dye metrial reaction and results.

Wavelength chosen in the spectrophotometer = 580.06nm

Figure 06: isolated system of the gas Acetic acid /dye experiment

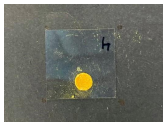

Figure 07: result of the gas/Acetic acid/dye experiment

For the gas experiment, we variate the concentrations of the acetic acid id different well closed bottels.

sample	Ac-OH ppm	RGB values	Intensity
Org S1	0	R=121.96/G=76.22/B=54.05	4613.478
Yel S1	0	R=114.53/G=85.89/B=49.21	6110.168
Org 10%	30.9	R=114.59/G=85.83/B=49.03	7297.871
Org 20%	39	R=114.69/G=82.97/B=57.34	7488.239
Org 30%	58.5	R=116.17/G=82.17/B=53.87	8430.164
Org 40%	78	R=118.69/G=82.26/B=54.96	7001.421

Table 03:gas resuls of gas reaction reaction with different concentrations

RESULTS

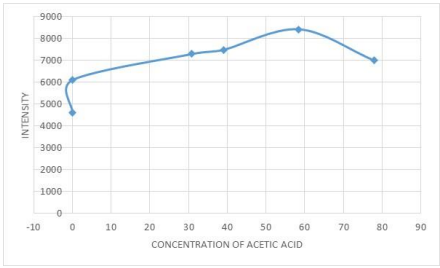

Figure 08:The color intensity of each sample, versus the concentration of acetic acid in the same sample

We noticed that values given by the device we are developing, and those given by spectrophotometer, are compatible. Thing that proves the efficiency of the sensor.

CONCLUSIONS

The acetic acid optical sensor is still in the developing stage,
But the results we have reached so far are very encouraging.
However, we need to develop the performance of the device and change its shape in order to facilitate its use and marketing.

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