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## Silicon nitride capacitive chemical sensor for phosphate ion detection: Environmental applications

Barhoumi Lassaad<sup>1</sup>, Abdelouatif baraket<sup>2</sup> and Abdelhamid Errachid

<sup>1</sup>NANOMESENE Lab, Tunisia

<sup>2</sup>University of Lyon, France

In this work, we reported the development of a highly sensitive capacitance chemical sensor based on a copper C-C-C-C-tetra-carboxylic phthalocyanine-acrylate polymer adduct (Cu(II)TCPC-PAA) for phosphate ions detection. A capacitance silicon nitride substrate based Al-Cu/Si-p/SiO<sub>2</sub>/Si<sub>3</sub>N<sub>4</sub> structure was used as a transducer. These materials have provided good stability of electrochemical measurements. The functionalized silicon-based transducers with a Cu(II)Pc-PAA membrane were characterized by using Mott-Schottky technique measurements at different frequency ranges and for different phosphate concentrations. The morphological surface of the Cu(II) Pc-PAA modified silicon-nitride based transducer was characterized by contact angle measurements and atomic force microscopy. The pH effect was also investigated by the Mott-Schottky technique for different Tris-HCl buffer solutions. The sensitivity of silicon nitride was studied at different pH of Tris-HCl buffer solutions. This pH test has provided a sensitivity value of 51mV/decade. The developed chemical sensor showed a good performance for phosphate ions detection within the range of 10<sup>-10</sup> to 10<sup>-5</sup>M with a Nernstian sensitivity of 27.7mV/decade. The limit of detection of phosphate ions was determined at 1nM. This chemical sensor was highly specific for phosphate ions when compared to other interfering ions as chloride, sulfate, carbonate and perchlorate. The present capacitive chemical sensor is thus very promising for sensitive and rapid detection of phosphate in environmental applications.

### Biography

Barhoumi Lassaad is a PhD student in NANOMaterials and Microsystems for Healthcare, Environment Monitoring and Energy (NANOMISENE) Laboratory, Centre for Research on Microelectronics and Nanotechnology CRMN, Technopark of Sousse, University of Sousse. He is engaged in the characterization of metal nanostructures and its application in sensing.

barhoumilassaad@yahoo.fr

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