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APPLIED PHYSICAL CHEMISTRY LAB

ELECTROCHEMICAL DETECTION OF H_2O_2 FOR REAL-TIME MONITORING OF OXIDATIVE STRESS

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Introduction

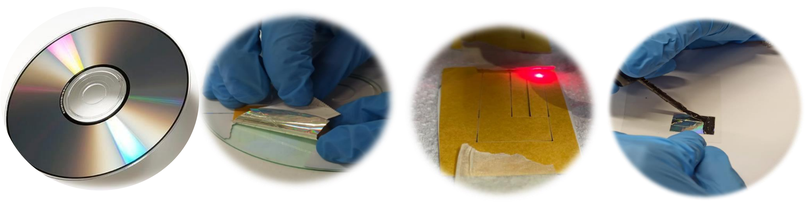
An increase in H_2O_2 concentration, known as **oxidative stress**, in **exhaled breath** of patients, has been observed and considered as a reliable indicator of lung diseases [1].
This work aims at developing an electrochemical sensor that can be inserted into normal face masks to detect the concentration of H_2O_2 in exhaled air, monitoring the oxidative stress in real time.

Telemedicine

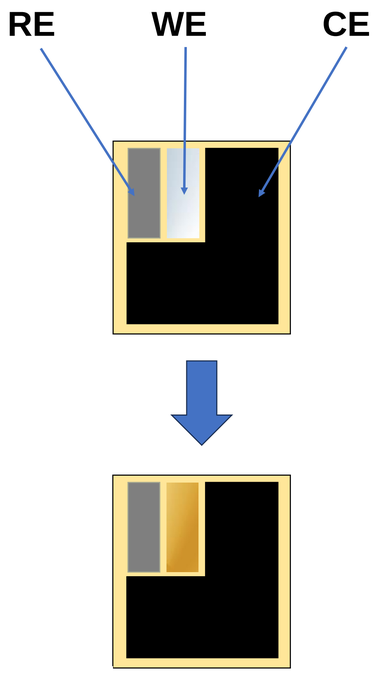
Work safety

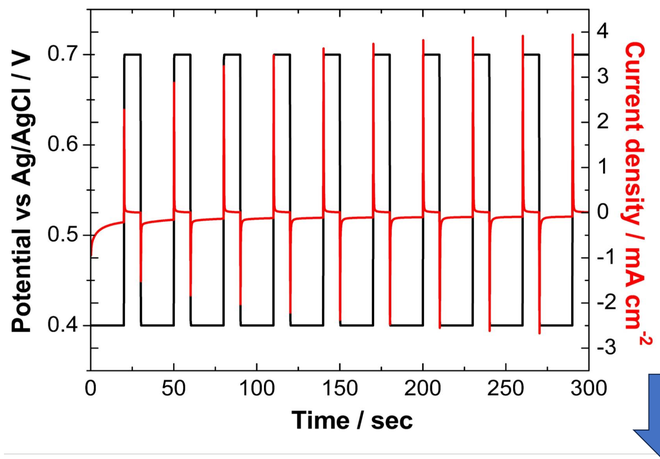
Fabrication

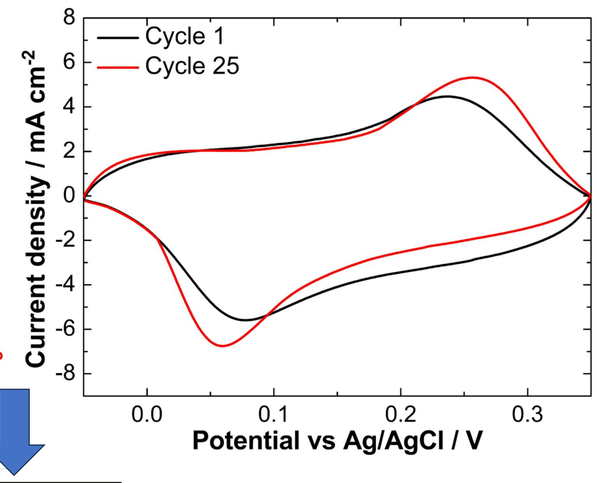
The sensor was realized according to our previous work [2]. It was modified with the deposition of **Prussian Blue nanoparticles** to detect smaller concentrations of H_2O_2 [3].



Au Sputtering on WE → **Pulse Electrodeposition** → **Cyclic Voltammetry**







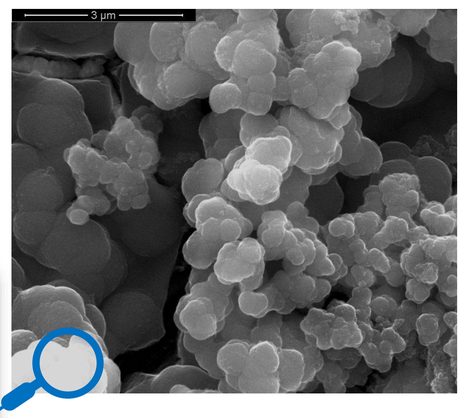
Electrodeposition solution:
10 mM $FeCl_3$
10 mM $K_4[Fe(CN)_6]$
0.1 M HCl/KCl
0.01% Chitosan

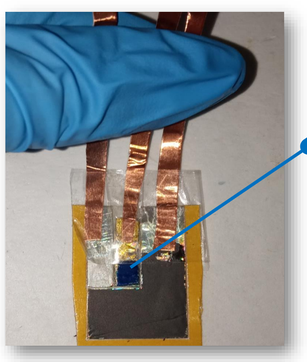
In 0.1 M HCl/KCl

Characterization

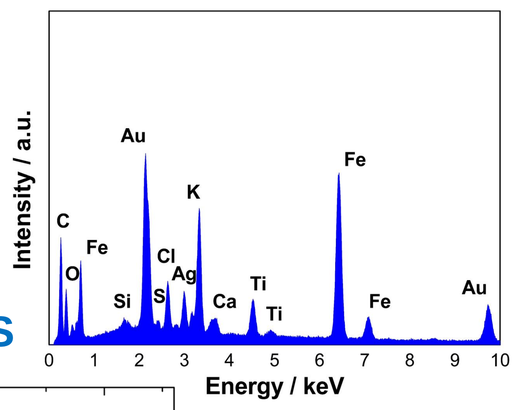
These analyses confirm the presence of Prussian Blue nanoparticles on WE [4].

SEM

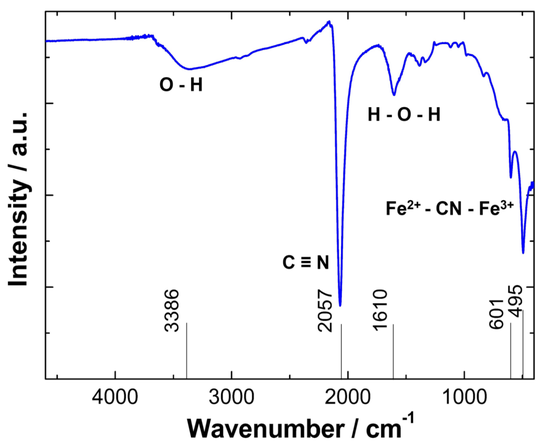




EDS

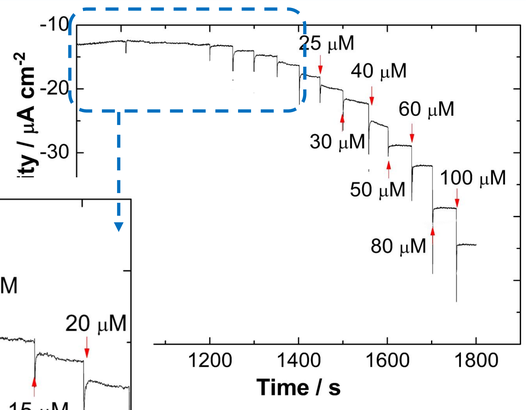


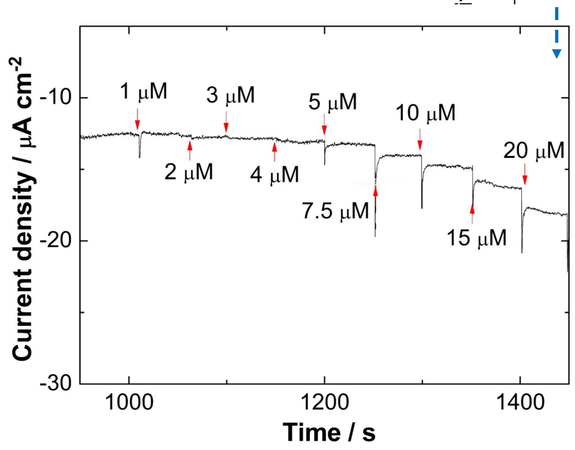
FT-IR

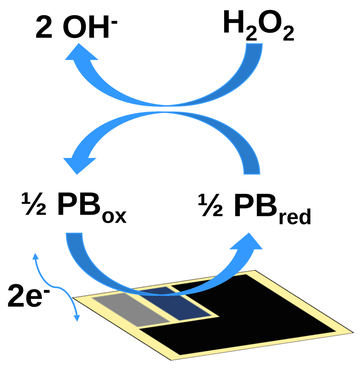


Sensor performance

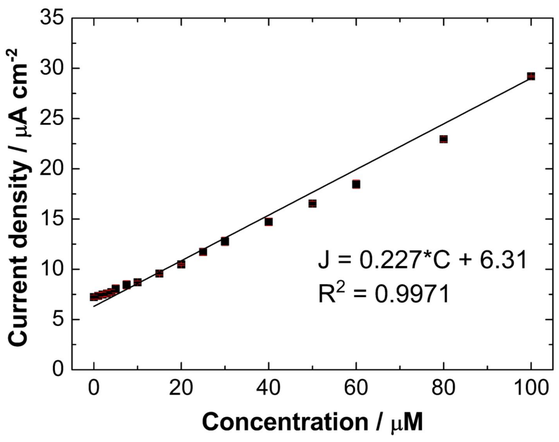
Cronoamperometry: -0.05 V vs Ag/AgCl







CALIBRATION LINE



Conclusions and future directions

This study reported the development of a wearable sensor for detecting H_2O_2 in exhaled air. A linear range from 1 to 100 µM was obtained with a sensitivity of 0.227 $\mu A \mu M^{-1} cm^{-2}$ for liquid phase.

These electrochemical tests should be repeated in aerosol phase to simulate the humid atmosphere of exhaled breath.

Acknowledgements

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