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GOLD NANOPARTICLES-rGO BASED ELECTROCHEMICAL SENSOR FOR THE DETECTION OF H_2O_2

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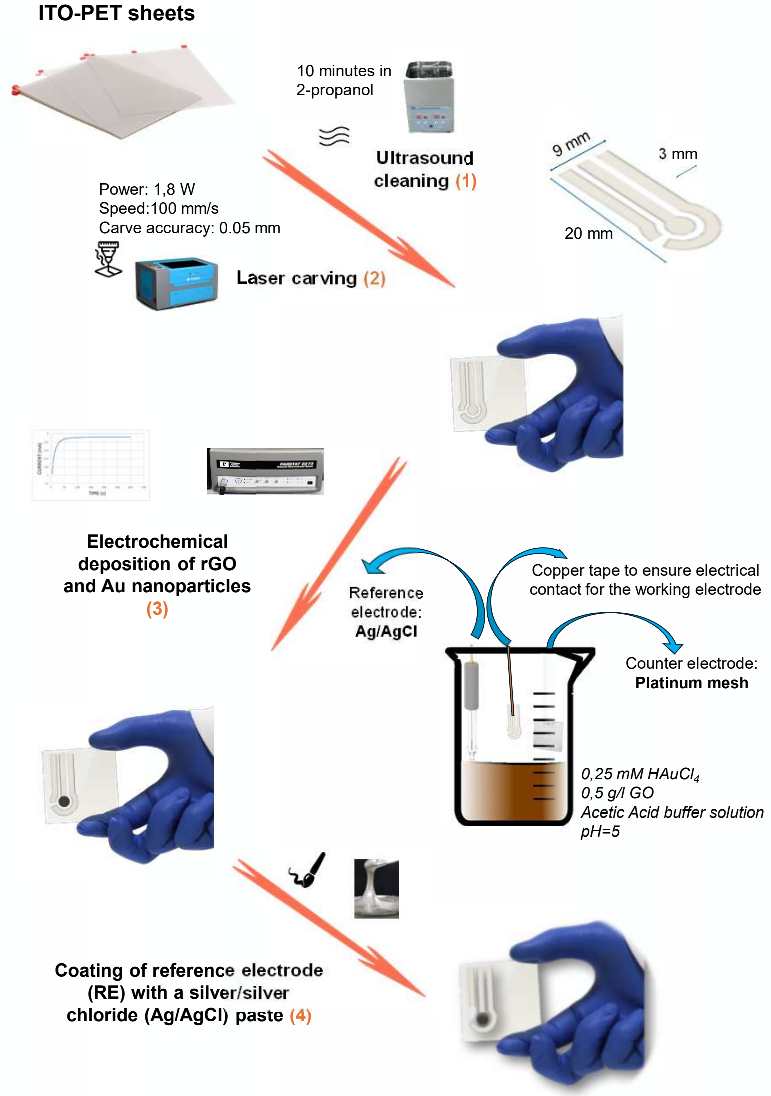
Introduction

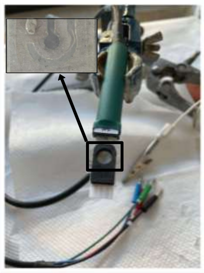
To provide useful information about people's health, wearable **sensors** are an interesting tool because of their rapid response, small size, low cost, and ease of use. An important condition to monitor for healthcare is oxidative stress. This condition arises when reactive oxygen species (ROS) such as hydrogen peroxide (H_2O_2), superoxide anion ($O_2^{-\cdot}$), etc. have a higher concentration than the physiological one, and this can lead to various diseases. So, detecting $\mathbf{H_2O_2}$ in biological fluids is useful to monitor oxidative stress. This research aims to detect hydrogen peroxide with an electrochemical **nanostructured** sensor based on **ITO-PET** (indium tin oxide-polyethylene terephthalate) sheet modified with reduced graphene oxide (**rGO**) and **gold nanoparticles**.

Sensor fabrication



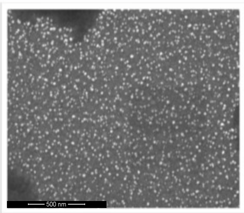
Results

The electrochemical reduction of H_2O_2 led to the formation of H_2O. This **reaction** produces electrons, resulting in an electric current that can be correlated with the concentration of H_2O_2 in samples



Experimental setup

Electrode morphology

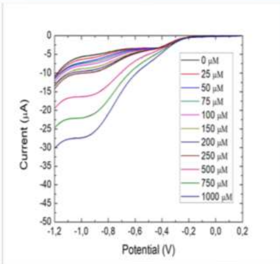


SEM image of the nanostructured electrode

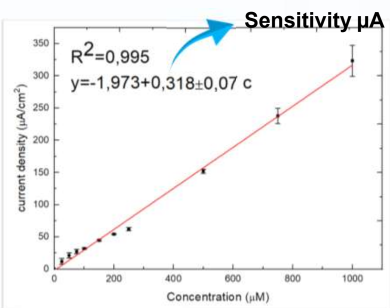
From the **SEM image**, it is possible to see the typical rGO sheet-like structure. Furthermore, this sheet is decorated with AuNPs with an average size of 30 nm.

Electrochemical characterization

$\mathbf{H_2O_2}$ **sensing** was carried out in **phosphate buffered saline** (pH=7,4) with an **LSV technique** from 0.2V to -1.2V vs Ag/AgCl. The current peak is located around -0.8V vs Ag/AgCl.



LSV curves



A **linear relationship** was observed between current density and H_2O_2 concentrations.

Linear range: from 25 μM to 1000 μM

Conclusions and future perspectives

Due to the fabrication route, the device proposed here has many advantages, such as flexibility and cost-effectiveness. The device can work with a small amount of sample volume. In addition, it works with an internal reference and counter electrode, so this sensor is portable and user-friendly, making it suitable for applications in situ. The working electrode was electrodeposited with AuNPs and rGO. This composite has a **great surface area** and is very powerful in **catalyzing the electrochemical reduction of hydrogen peroxide,** allowing its detection with high sensitivity.

Acknowledgment

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