Amperometric gaseous H_2O_2 sensor based on ultra-low platinum content electrocatalyst

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Detecting gases and volatile compounds using electrochemical gas sensors presents ongoing challenges regarding sensitivity and selectivity. Many scenarios demand rapid, sensitive, and user-friendly sensors capable of detecting gaseous hydrogen peroxide (H_2O_2) at room temperature. In this study, we introduce an H_2O_2 gas sensor utilizing sodium polyacrylate aqueous gel electrolytes combined with commercially available screen-printed carbon electrodes, where the working electrode has been modified with low platinum content-MWCNT electrocatalyst.The examined electrolyte facilitates the accumulation and stabilization of the gaseous analyte, allowing for its rapid and sensitive detection of the highly active sensing material. Notably, the sensor demonstrates high sensitivity below the mg m^{-3} range, exhibiting linear responses across concentrations ranging from 10 to 70 mg m^{-3} after just 5 minutes of accumulation and 1 to 10 mg m^{-3} after 10 minutes of accumulation under ambient conditions.
The simplicity of the sensor's setup and its robust electroanalytical performance renders it highly promising for various applications in emerging fields such as clinical diagnostics [1], explosive detection [2], environmental monitoring [3], and occupational health and safety [4].

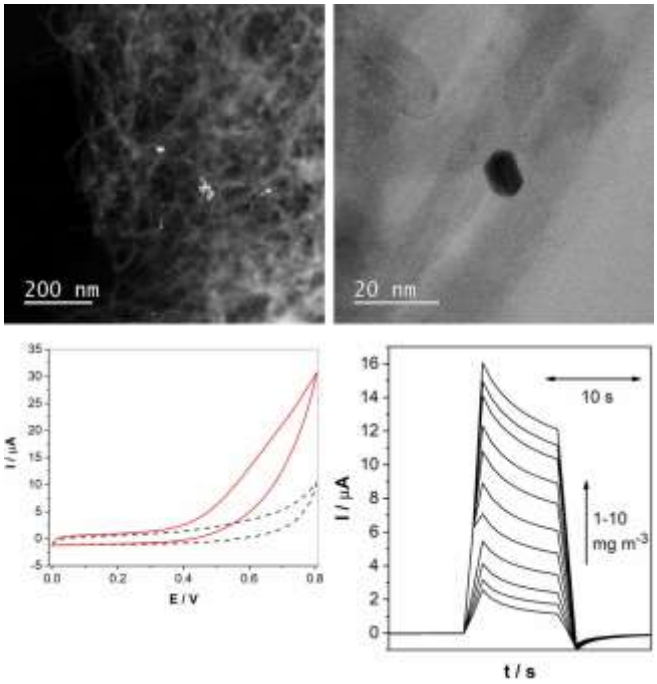

Figure 1. Above, TEM images depicting low content Pt on MWCNT. The bottom left: CV response of the gas sensor in the absence (black dashed line) and the presence of H_2O_2 (red solid line). Bottom right: chronoamperometric response of the gas sensor for different concentrations of H_2O_2, measured at 0.5 V

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