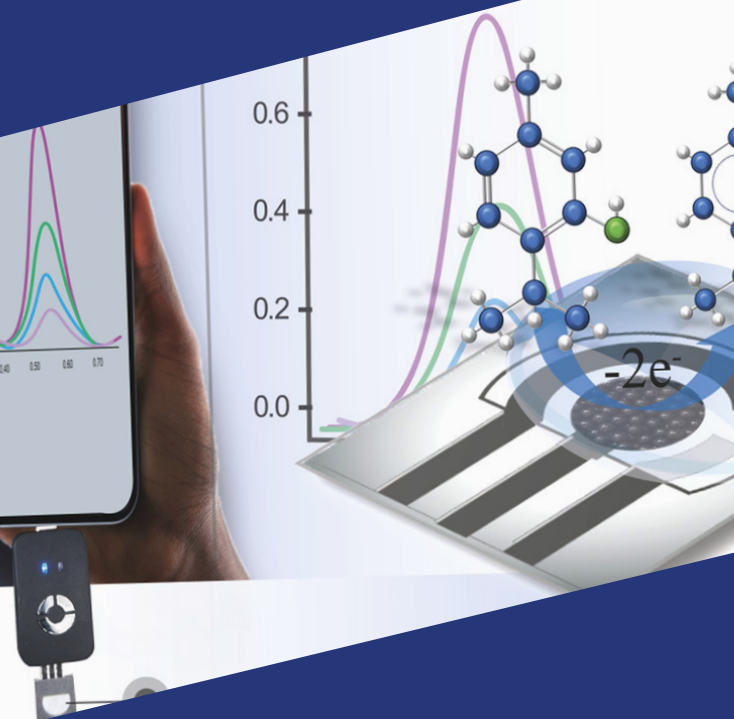


# Paper-Based Electrochemical (bio)Sensor for Bioactive Compounds and Pathogen Detection.

A low-cost, eco-designed sensing platform for rapid, on-site assessment of antimicrobial activity and surface contamination



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## Challenge Addressed

Industries developing antimicrobial formulations and surfaces lack accessible, rapid, and cost-effective tools to assess the bioactive compound release, antimicrobial effectiveness, and surface contamination. Existing analytical methods are often laboratory-based, time-consuming, and costly, limiting their use in quality control, R&D, and on-field monitoring.

## The Solution

Paper-based electrochemical (bio)sensing tools capable of quantifying essential oils responsible for antimicrobial activity and SARS-CoV-2 on surfaces. The sensor combines disposable paper-based electrodes with carbon-black nanomaterial enhancement and portable read-out instrumentation. The detection of SARS-CoV-2 on the surface has been demonstrated through a prototype immunosensor, while the detection of essential oils has been achieved through the differential pulse voltammetric technique.

## Key Benefits

<p>A <b>versatile and affordable analytical solution</b> suitable for research, industrial quality control and on-site monitoring.</p>	<p>Paper-based format, <b>reducing material use and environmental footprint</b> while enabling mass production and easy deployment.</p>
<p>Modular design allowing for <b>adaptation to multiple targets</b>, including antimicrobial potency, essential oil release and viral contamination.</p>	<p>Reagent-free operation and <b>eco-designed</b> architecture enable rapid, <b>low-cost and scalable testing</b> across liquids, gases, surfaces and aerosols, both in laboratory and field conditions.</p>

## Application Areas

- Immediate applications: R&D laboratories and research organisations requiring rapid screening of antimicrobial formulations.
- In the medium term: supports quality control workflows in coating, textile and appliance industries, as well as environmental monitoring and surface hygiene assessment.
- Long-term: integration into commercial sensing platforms and diagnostic devices.

## Validation - TRL 5-6

The platform has been validated through laboratory testing of essential oil detection and pathogen sensing, including proof-of-concept demonstration for SARS-CoV-2. Performance validation includes sensitivity, reproducibility and adaptability across different matrices.

## Sustainability & Safety

The sensor is designed following eco-design principles, using paper substrates and minimal reagents. Its low material consumption, disposability and compatibility with portable instrumentation support sustainable monitoring solutions while reducing dependency on complex laboratory infrastructure.