A Paper-based device for surface essential oils monitoring

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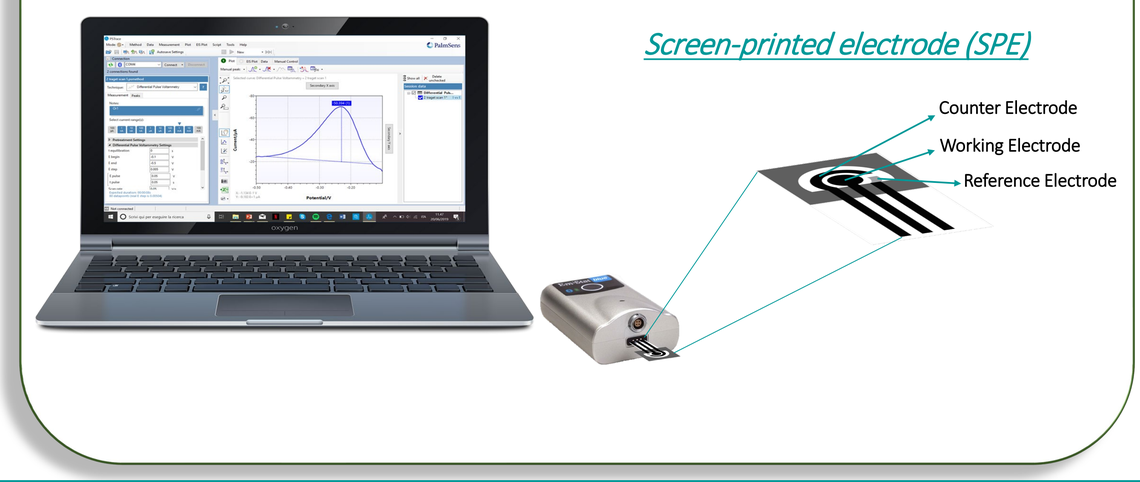
Introduction

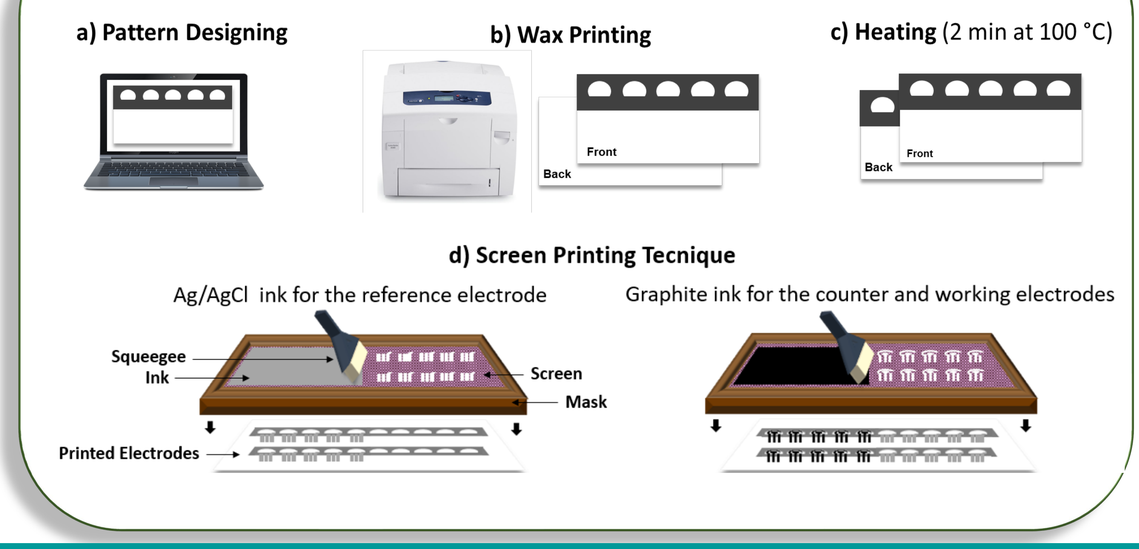
Paper-based electrochemical (bio)sensors have emerged as highly attractive analytical devices for their superior sustainable features, such as avoiding the use of polyester as support and the reduction of waste, being incinerated after use. However, paper-based electrochemical (bio)sensors have recently demonstrated further advantages, including the simple combination with vertical microfluidics and their use as a reservoir to deliver smart electrochemical (bio)sensors able to i) contain the reagents, ii) preconcentrate the target analyte, and iii) synthesize the nanomaterials inside the paper network. Furthermore, these devices have demonstrated their ability to overcome the limitations of the other printed electrochemical sensors in the measurement of entirely liquid samples by detecting the target analyte in the aerosol phase or solid sample, without the additional sampling system (F. Arduini, 2022, doi.org/10.1016/j.coelec.2022.101090). Herein, we developed a paper-based device for the detection of essential oils on the surface, as smart tool to evaluate the availability of these compounds on functionalized surface.

Experimental section

EXPERIMENTAL SET-UP



FILTER PAPER-BASED SPEs FABRICATION

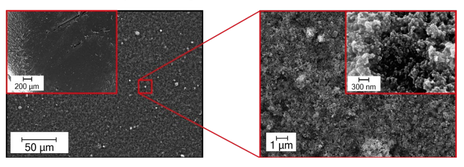


Experimental results

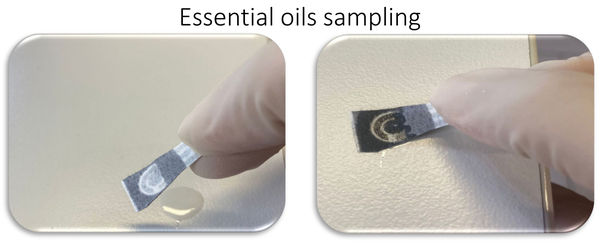
The control of the presence of essential oils on the surface was performed easily putting the paper strip in contact with the site wetted by oils. These paper-based devices were embedded with portable potentiostat combined with a laptop to easily manage the data.

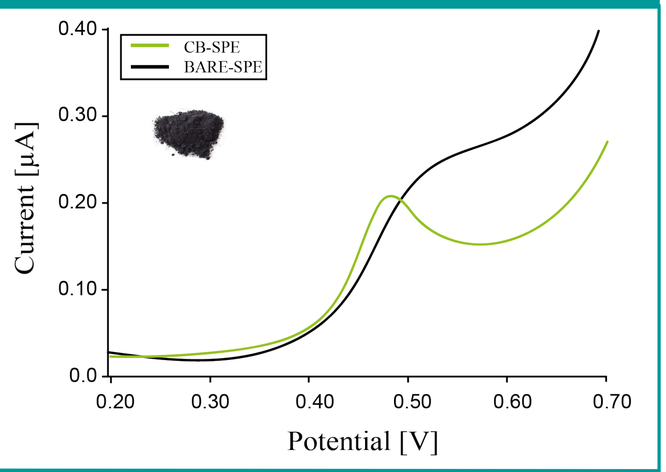
The modification of the working electrode surface with carbon black dispersion (CB) was demonstrated to be essential for the sensitive detection of essential oils. Only in the presence of CB modification a well-resolved analytical signal of thymol 4 ppm was observed (green line).

Morphological characterization

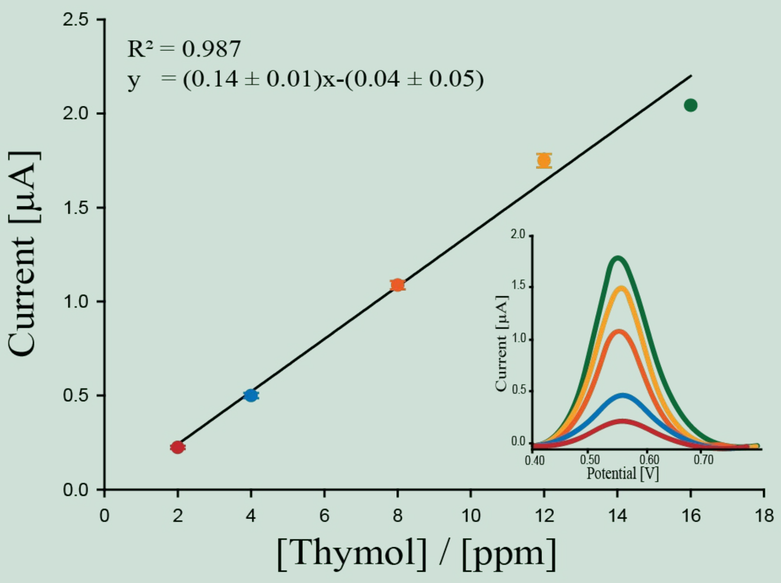


Essential oils sampling

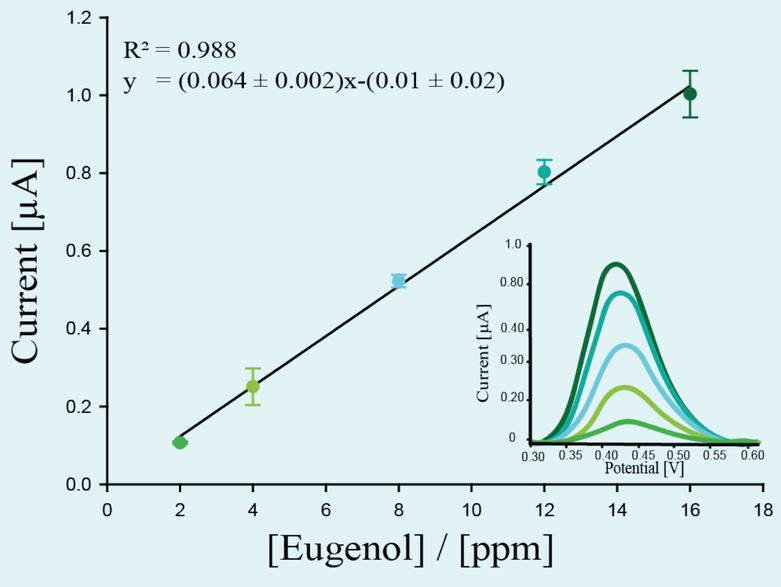




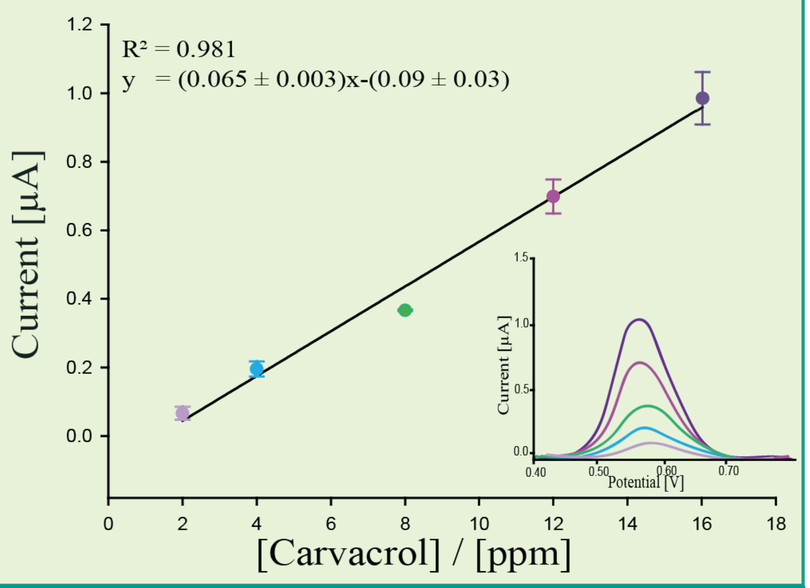
Thymol



Eugenol



Carvacrol



Conclusion

The results obtained have demonstrated the ability to detect essential oils such as thymol, eugenol, and carvacrol on the surface using a paper-based device. This method offers the advantage of simplicity, sustainability and provides broad and promising applications for the detection of these substances.

RELIANCE project partners

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