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BIOSENSORS FOR PANDEMICS

Towards the development of low-cost smart textiles for the real-time monitoring of bacterial and fungi colonies

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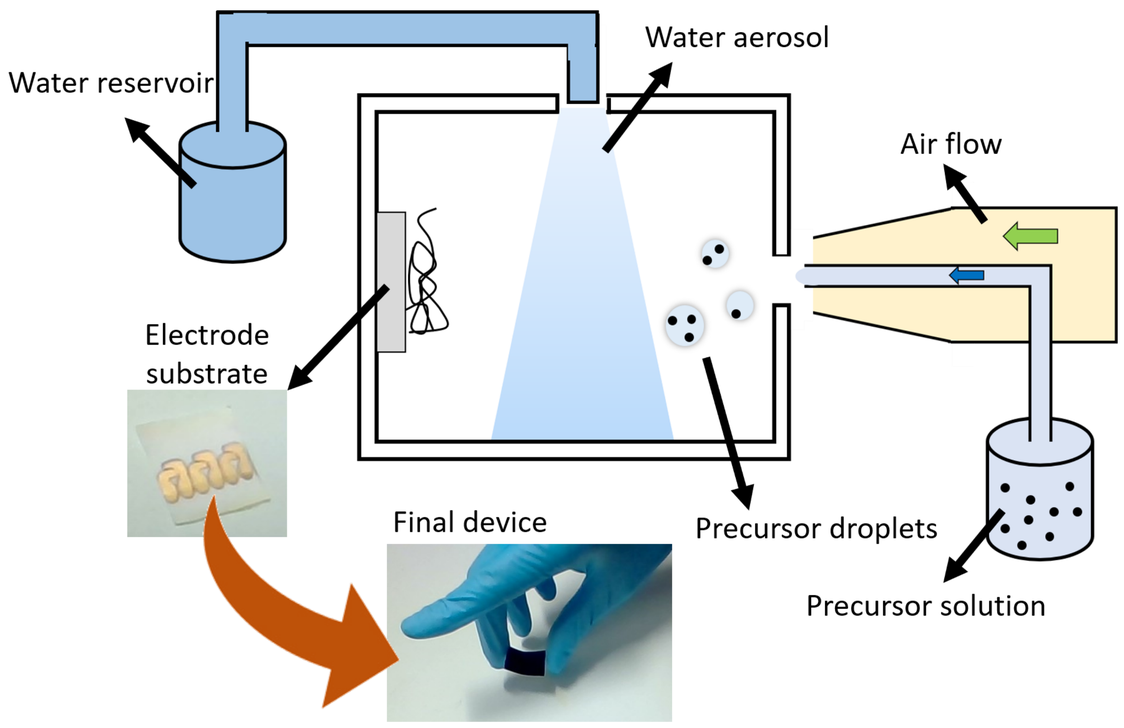
Introduction

- Current methods for the detection of infectious bacteria and fungi are expensive, and often require laborious preparations (i.e. bacterial cultures).
- Bacterial and fungal colonies communicate through the exchange of quorum sensing molecules, which are typically specific for the species. Thus, a sensing device that can specifically detect such compounds could be used for the early diagnosis of infections.
- A rapid and low-cost method for the fabrication of nanocomposite sensing fibres is reported. Such method led to the development of flexible and miniaturised devices that could be integrated with molecularly imprinted nanoparticles for the selective detection of tryptophol, a molecule exchanged by fungal colonies.
- The biocompatibility of the materials employed in this study made the devices suitable for their incorporation in wound dressings and medical devices.

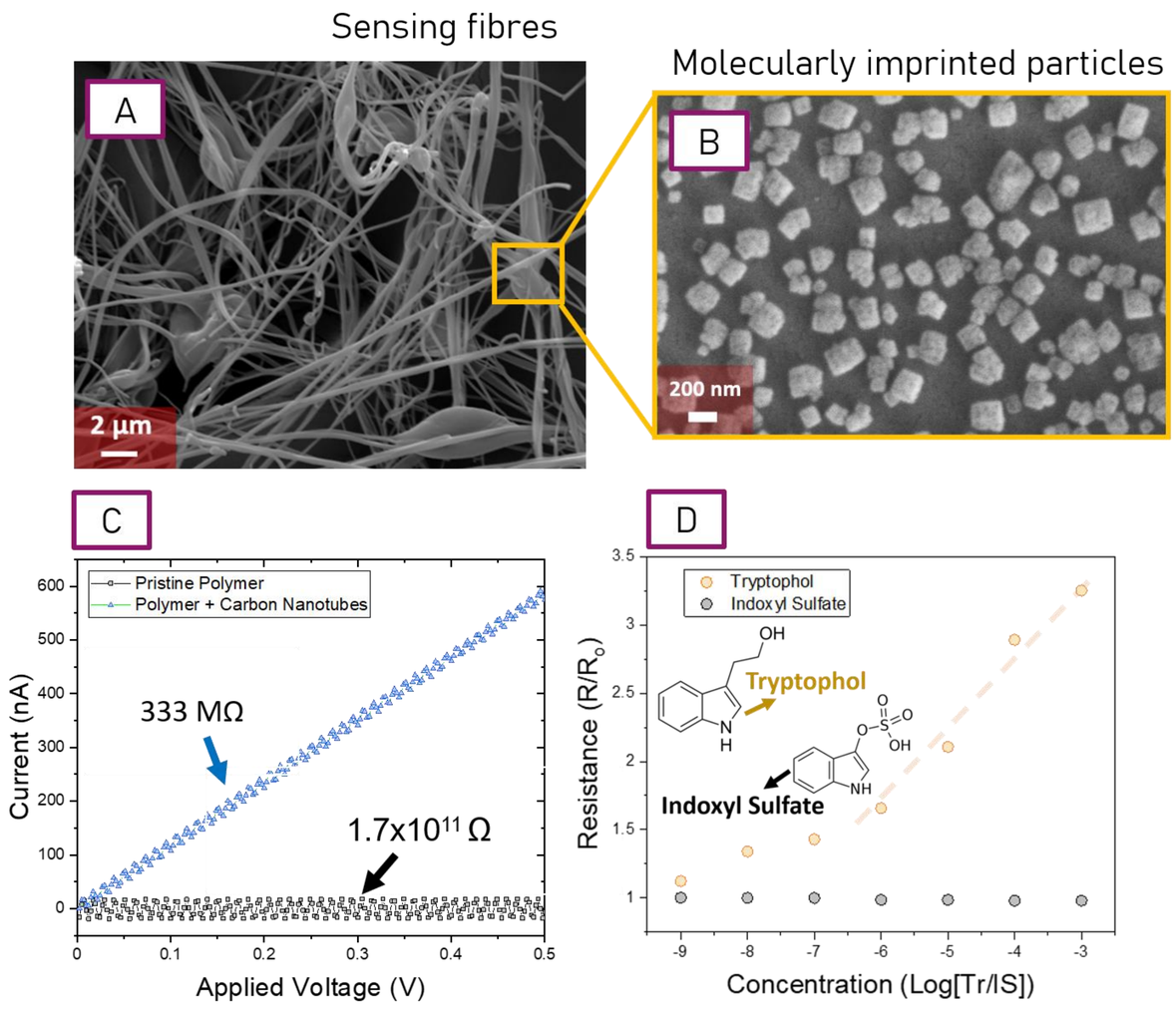
Method

- Herein, a new deposition method was developed for the fabrication of flexible and conductive. This method was based on AACVD, by exposing the precursor aerosol to a high humidity.
- This method could be used for the development of biocompatible sensors by the incorporation of molecularly imprinted nanoparticles inside the precursor solution.



Results

- **A)** The fibres developed by this method presented a size in the range of 200 nm, and molecularly imprinted nanoparticles could be introduced for the sensing.
- **B)** Molecularly imprinted nanoparticles could successfully be incorporated, giving specificity to the fibres.
- **C)** The conductivity of the fibres could be improved by the incorporation of carbon nanotubes in the precursor solution. Such conductivity was crucial for the sensing.
- **D)** The final device showed a high selectivity towards tryptophol compared to similar analytes such as Indoxyl sulfate when measuring resistivity changes in the films.



Conclusions

- Flexible sensing devices containing 50 nm thick gold electrodes and nanocomposite sensing fibres could successfully be developed, with a LOD in the range of 100 nM.
- The sensors showed a high selectivity, being able to discern between tryptophol and indoxyl sulfate.

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