CONDUCTIVE ELECTROSPUN NANOFIBERS FOR MULTIFUNCTIONAL PORTABLE DEVICE

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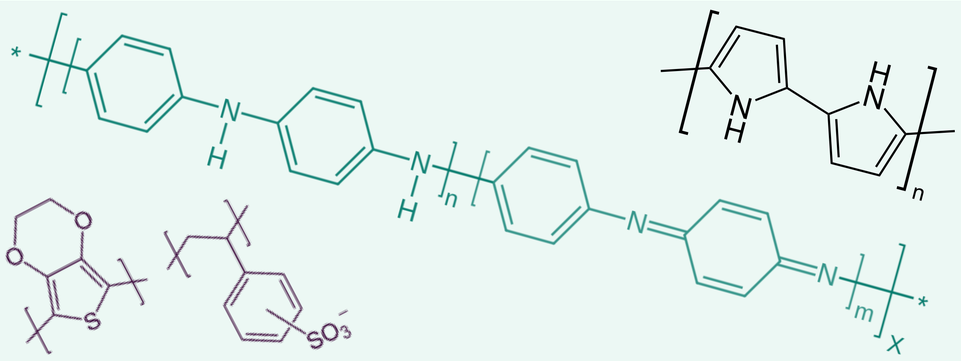
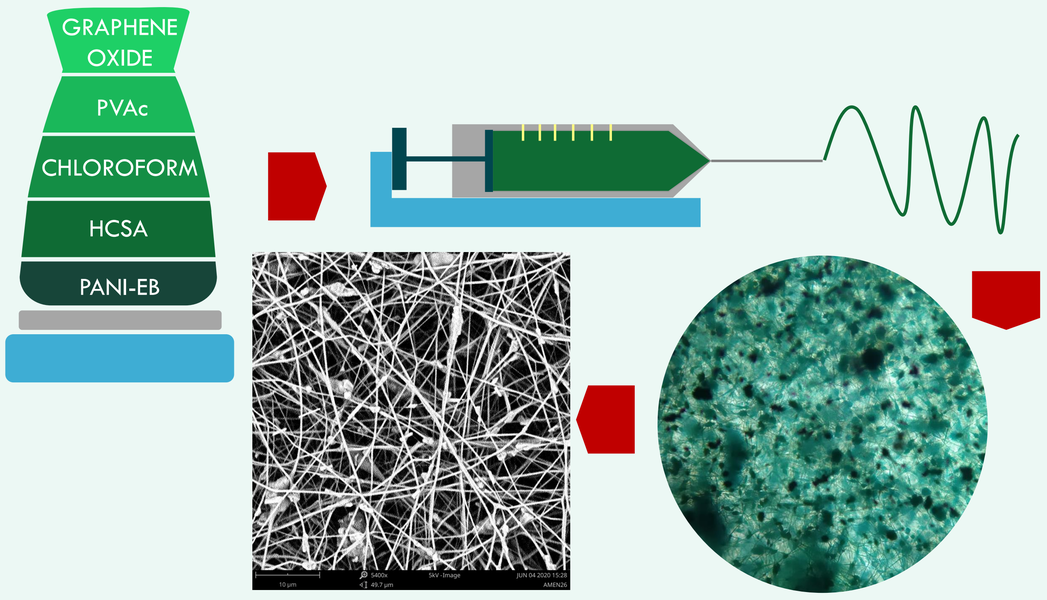
INTRODUCTION

Conducting polymers possess highly attractive characteristics, such as an easily controllable bandgap, high mechanical flexibility, anticorrosive properties and greater biocompatibility than that of many inorganic materials. Nowadays the use of this kind of polymers as sensitive materials is more and more frequent. When conductive polymers are electrospun, resulting fibers are endowed with superior electrical and optical properties, even comparable with those of metals and inorganic semiconductors, thus allowing their use in specific fields, where those properties are strictly required.

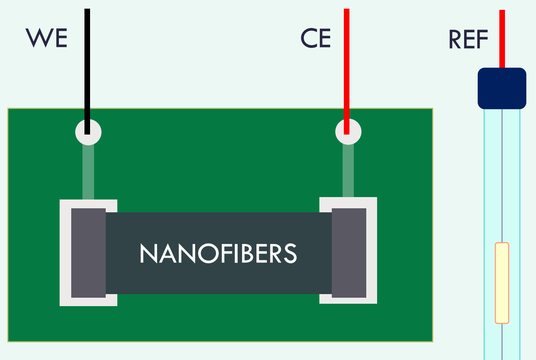


SYNTHESIS, CHARACTERIZATION AND METHODS



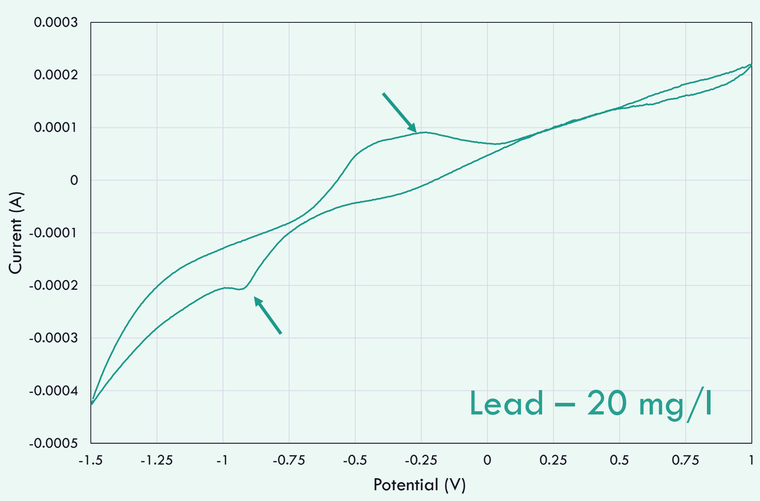
Nanofibers were collected using the electrospinning technique. This technique allows to spin a polymer solution through the use of a high potential electric field. Electrospinning solution was obtained dissolving camphor-10-sulfonic acid (HCSA) and polyaniline emeraldine base (PANI-EB) in chloroform. Poly (vinyl acetate) and graphene oxide were then added in the solution.

Scanning electron microscopy (SEM) images reveal a randomly distribution of fibers with a presence of agglomerates attributable to PANI salt, whereas graphene oxide appears to be well distributed. The average diameter of fibers is below 500 nm.

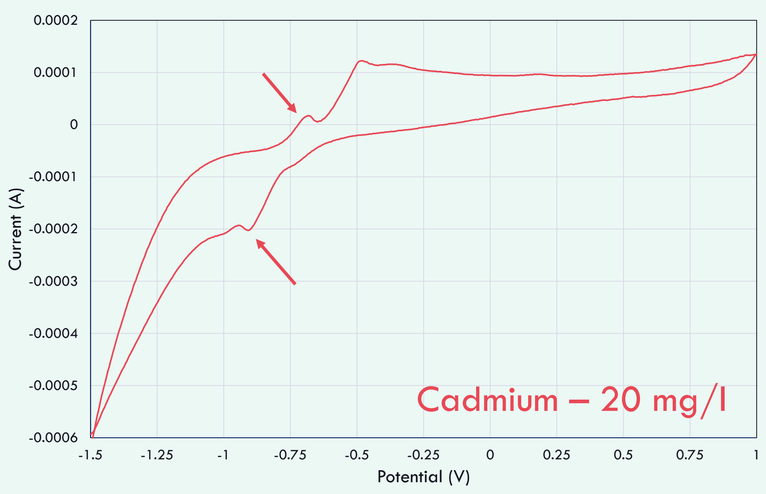


Printed circuit board (PCB) was used as a base to create a sensor, welding nanofibers to the two electrodes. Cyclo-voltammetry measurements were carried out using a AMEL 7050 potenziostatic/galvanostatic, with a potential in the range -1.5 V to 1,0 V and a scan rate of 50mV/s. Three-electrode setup was used to realize the measure, dipping them in a buffer solution with lead or cadmium iones.

RESULTS AND DISCUSSIONS



The results of cyclo-voltammetry measuraments showed typical peaks related to the two metals present individually in the solution.



CONCLUSION

The innovative hybrid material based on polyaniline/polyvinyl acetate/graphene oxide nanofibers, obtained through the electrospinning process, were proved to be capable to detect heavy metals. In particular, both cadmium and lead aqueous solutions were successfully analyzed.
Future goals are aimed to test the realized membranes towards lower concentrations. Moreover further investigations will be carried out to test the selectivity of this system, when two or more metals are simultaneously used. The sensor will be finally integrated in a compact and low-cost portable device.

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