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*Abstract*

# Hybrid Inkjet-Printable Paste for Screen-Printed Electrodes †

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Nowadays, Gram-negative bacteria (GNB) are among the most significant public health and environment concerns in the world due to their high resistance to antibiotics. According to a recent study [1], 47 out of 100 patients are infected with multi-drug-resistant GNB such as Pseudomonas Aeruginosa. Since it occupies the second position on the World Health Organization's (WHO) list [2], regarding its widespread occurrence and being one of the major factors that cause endotoxemia and pulmonary affections [3], new methods of detection need to be developed. This work describes the preparation and characterization of a hybrid inkjet printable paste, which includes in its composition as recognition units molecularly imprinted polymer nanoparticles (MIP-NPs). The prepared MIP-NPs are capable of recognizing lipopolysaccharides (LPS), the endotoxin that compose the outer membrane of GBN, when printed on the surface of a working electrode. Screen-printed electrodes (SPE) are portable devices that represent a fast and cost-effective solution, as they can be printed on large scale from a low quantity of printable paste. SPEs have found use in detection and recognition processes, making them suitable for this type of application [4].

In this study, we report the preparation and characterization of the inkjet printable MIP paste, obtained by the incorporation of molecularly imprinted polymer nanoparticles (MIPs) in a lab-made formulation, using commercial carbon paste. Thus, the incorporation takes place in two phases: (1) the homogenization of MIPs particles and ZnO electroactive particles in a compatible solvent, and (2) the addition of a commercial printable paste and a polyether as a binder. The resulting paste is then printed on the surfaces of working electrodes.

The obtained printable paste is characterized using modern techniques, such as structural and rheological analyses, to highlight the successful incorporation of MIPs nanoparticles and to establish an optimal flow profile for the formation of hybrid paste, suitable for printing on screen-printed electrodes. The obtained screen-printed electrodes are subjected to cyclic voltammetry analyses for LPS recognition.

Consequently, the obtained printable paste holds great potential for developing new generations of sensors for detecting the LPS from Pseudomonas Aeruginosa.

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