The potential of artificial antibodies as biosensing devices for monitoring the Interleukin 2 cancer biomarker

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Cancer is among the major causes of death throughout the world. This disease is commonly known as the transformation from normal cells into abnormal cells that divide without control and can invade nearby tissues of the human body. Tumor markers are biomolecules, usually proteins, that are produced by the body in response to cancer growth, and that may be detected in biological samples, like blood, urine and tissues.

Interleukine 2 (IL-2) is a glycoprotein with numerous functions, the most important one being the stimulation of antigen-activated T cell proliferation [1]. It promotes the growth and activity of these cells, and consequently, affects the development of inflammatory processes from the immune system. The discovery of novel non-invasive biomarkers, such as IL-2, and its fast determination at low cost is presently required, to enable its use over wide screening programs and applications in point-of-care context.

As an original approach, the current work proposes a novel artificial antibody for IL-2 detection based on molecular imprinted polymer (MIP) technology. The electrical biosensor was tailored on top of a disposable conductive glass covered by fluorine doped tin oxide (FTO), previously modified with the electrodeposition of platinum particles, using a conventional electrochemical cell of three electrodes, following a bottom-up approach. The several stages of this process included the biochemical modification of the platinum particles and the assembly of a MIP or non-imprinted polymer (NIP) layer, which were characterized by electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) (**Figure 1**). The analytical performance of the devices provided sensitive readings of IL-2 from concentrations below 0.0010 up to 10 µg/mL. The surface morphology of these sensory materials was characterized by Scanning Electron Microscopy (SEM) (**Figure 2**), and compared with regard to their chemical modifications.

In conclusion, the devices developed are a promising tool for monitoring the IL-2 in point-of-care applications, due to their simplicity of manufacture, low-cost, good sensitivity and selectivity.

References

[1] Owens, O.J., Taggart, C., Wilson, R., Walker, J.J., McKillop, J.H., Kennedy, J.H., British Journal of Cancer **68** (1993) 364-367.

Figures

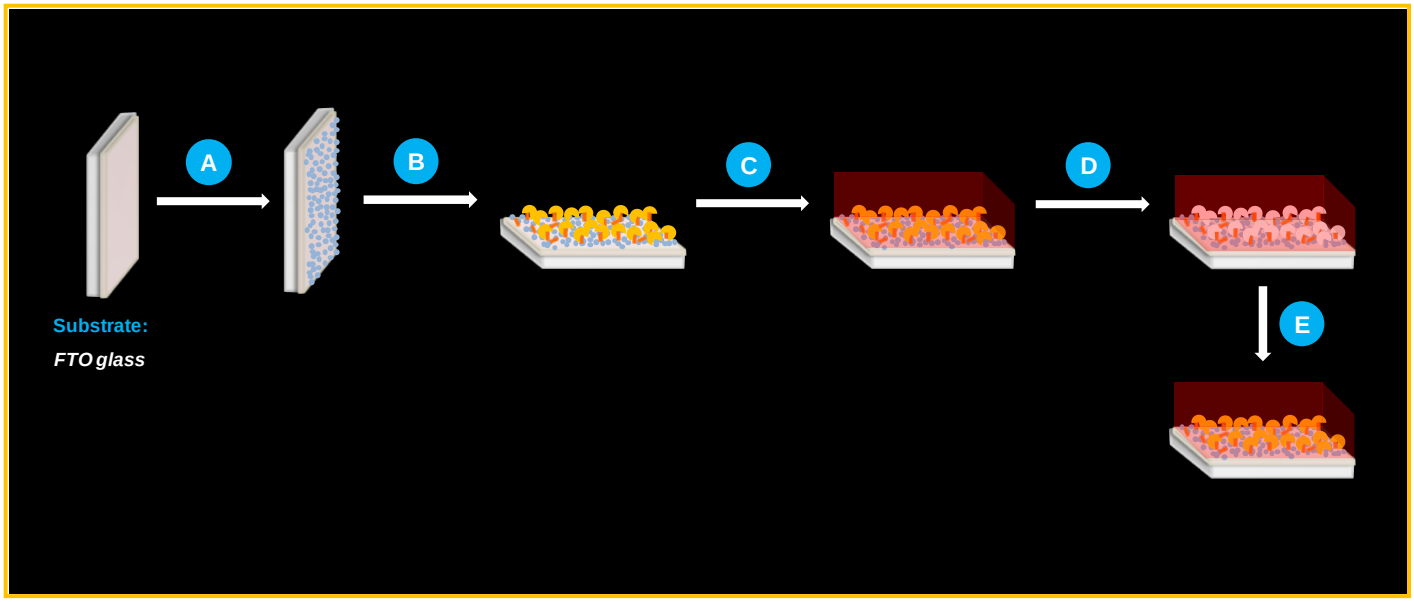

Figure 1. Schematic design of the sensor synthesis for IL-2 detection: (A) electrodeposition of the platinum particles on top of FTO surface; (B) incubation of aniline and IL-2; (C) electropolymerization of 4-aminothiophenol; (D) removal of protein with proteinase K; and (E) rebinding of IL-2 biomarker.

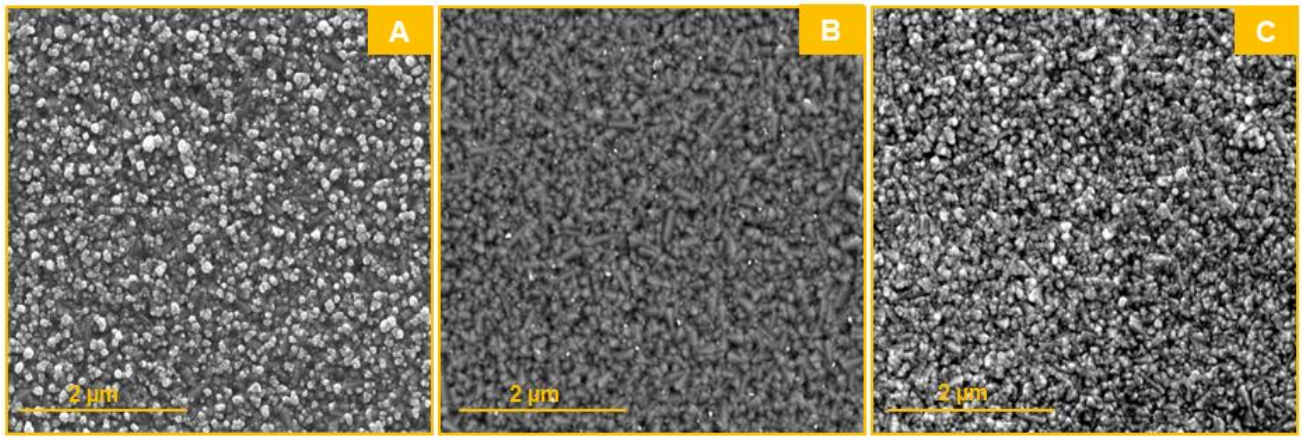

Figure 2. SEM characterization: (A) Platinum particles electrodeposited on top of FTO glass; (B) MIP material; and (C) NIP materials.

Acknowledgements

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