Synthesis of an antibody-like material for the detection of Albumin

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A novel molecularly imprinted polymer (MIP) is presented for the detection of Albumin, currently a biomarker of several diseases. The material acted as an antibody for Albumin and was obtained through a bulk imprinting approach, by electropolymerizing Eriochrome blackT (EBT) around the target protein. The overall process is represented in Figure 1.

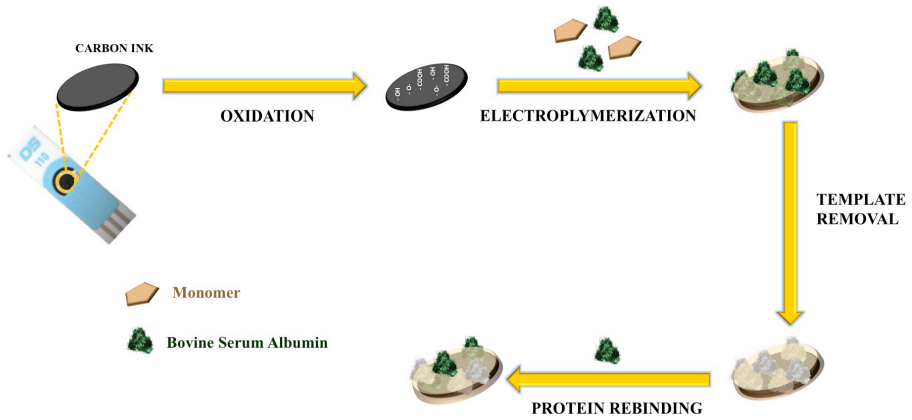

Figure 1 - Schematic representation of the synthetic process employed to produce the Albumin antibody-like material.

The electropolymerization was conducted on a carbon ink support that was the working area of a screen printed electrode (SPE). In a parallel study, the carbon ink was modified by electrodeposition of EDOT prior to the MIP synthesis, aiming to verify if higher sensitivities would be achieved with substrates of higher conductivity. Raman spectroscopy analysis was made to confirm all stages of the SPE surface modification.

All prepared sensors were calibrated by several electrochemical approaches, including cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and square wave voltammetry (SWV). Overall, both MIP-PEDOT and MIP-carbon displayed linear responses over a wide range of concentrations, being the MIP-PEDOT material more sensitive. The best technical approach was CV, combined with MIP-PEDOT antibody like materials (detection limits of 1.7×10^{-6} mol/L).

The behaviour of both sensory materials was further tested in synthetic serum samples, exhibiting good selectivity for Albumin. MIP-PEDOT showed the best performance in all voltammetric measurements, when compared with MIP-carbon.

In conclusion, the proposed SPEs were identified as a successful approach for the determination of Albumin in serum, especially in point-of-care applications. In addition, the presence of a conductive layer as PEDOT favoured the sensor response.

Acknowledgements

The authors acknowledge the financial support of European Research Council though the Starting Grant, ERC-StG-3P's/2012, GA 311086 (to MGF Sales).