3D printed graphene electrodes modified with Prussian blue for sensing of H_2O_2

V. Katic[(1)], P. L. dos Santos[(1)], M. F. dos Santos[(1)], B. M. Pires[(1)], H. C. Loureiro[(1)], A. P. Lima[(2)], J. C. M. Queiroz[(2)], R. A. A. Munoz[(2)], J. A. Bonacin[(1,*)]

[1] Institute of Chemistry, University of Campinas, 13083-970, Campinas, SP, Brazil
[2] Institute of Chemistry, Federal University of Uberlândia, 38408-100, Uberlândia, MG, Brazil.

Resumo: 3D-printing technologies are promoting a revolution in the field of electrochemistry, mainly in energy storage, energy conversion, electrochemical sensors, and point-of-care devices. This has been done due to the emerging of conductive filaments for 3D printer and owing versatility and freedom of design, waste minimization and, most importantly, fast prototyping[1,2].

Herein, we described for the first time the modification of 3D-printed graphene-based electrode with Prussian blue (PB) for detection of H_2O_2 (Figure 1). The stability, electrochemical properties and the performance of 3D printed electrodes modified with PB in the sensing of H_2O_2 were compared with traditional electrodes (GCE, Pt and Au) modified with PB. Using Batch Injection Analysis (BIA) system the analytical parameters obtained from amperometric calibration curves for hydrogen peroxide in 3D-PB electrode were: *i)* linear range: 1-700 $\mu molL^{-1}$, *ii)* LOD: 0.11 $\mu molL^{-1}$ and *iii)* LOQ: 0.37 $\mu molL^{-1}$ with $RSD_{(n=3)}$= 4.23 (Figure 1). Real samples of milk and mouthwash were analyzed using the BIA system and the recovery values ranged from 97 to 120%. These results indicate an adequate accuracy of the sensor for H_2O_2 determination in both samples. Moreover, the milk sample showed a micromolar amount of H_2O_2 which indicates the presence of H_2O_2 residues in milk. The mouthwash sample showed a value within the concentration range of H_2O_2 added to this kind of product.

As conclusion, it was observed that the 3D printed electrodes have electrochemical behavior similar to the conventional ones and they can be used in sensing of H_2O_2 in real samples of milk and mouthwash.

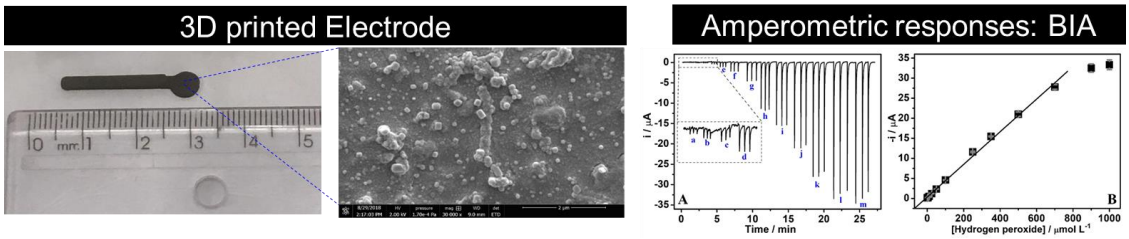

Figure 1. Photo of the 3D printed electrode and the SEM image of the surface (**left**); amperometric responses (BIA), using 3D-PB (n=3) and the standard solutions of H_2O_2 (**right**).

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Referências:

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* **e-mail do autor principal:** jbonacin@unicamp.br