

Bienzyme amperometric biosensor using a gold nanoparticle-carbon nanotubes composite electrode for the determination of glucosinolates in foods

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Glucosinolates are natural compounds present in Cruciferae vegetables such as cabbage or broccoli. They have attracted much attention because of their controversial toxic or anticarcinogenic properties¹. Methods for their determination are time consuming, and there is a need for improved fast and low cost glucosinolates biosensors with simple configurations. On the other hand, hybrid CNTs - gold nanoparticle materials have demonstrated interesting properties which can be profited for the preparation of electrochemical sensors and biosensors². In this communication, we present a biosensor design involving co-immobilization of myrosinase (MYR) and glucose oxidase (GOx) on a gold nanoparticle-CNTs composite electrode using Teflon as the non-conducting binding material, for the determination of glucosinolates in foodstuffs. The biosensor functioning is schematized in Figure 1. As can be seen, MYR catalyzes the hydrolysis of glucosinolates to form glucose. Then, glucose oxidation is catalyzed by GOx, giving H₂O₂ which is detected electrochemically at the bioelectrode without need of mediator.

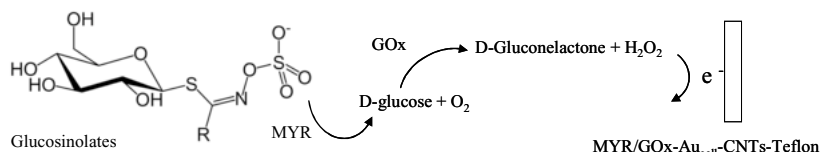


Figure 1. Scheme of the biosensor functioning

A single GOx biosensor was prepared with 50:50 w/w CNTs:Teflon, 360 μ l Au_{col} and 151 U GOx. Next, the MYR loading was optimized from the slope and linear range of calibrations graphs constructed for sinigrin, a representative standard of glucosinolates. A loading of 7.2 U MYR was selected due to the higher loadings tested. The analytical characteristics of the calibration plots for sinigrin were: linear range, 0.02-0.8mM; slope, 1.9 A/M; LOD (3s_b/m), 5.9 μ M. A good repeatability, with an RSD value of 3.2% (n=5) was also obtained. The biosensor responded within the \pm 3s limits during nine days. The value of K_M^{app} was 7.9 mM. Good results were obtained in the application of the biosensor to the determination of total glucosinolates in vegetables.

1. B. Wu, G. Zhang, S. Shuang, C. Dong, et al., Sens. Actuators, B, 106 (2005) 700
2. J. Manso, M. L. Mena, P. Yáñez-Sedeño, J. Pingarrón, J. Electroanal. Chem. 603 (2007) 1