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ELECTROCHEMICAL SENSOR FOR L-ARABITOL BASED ON 3D-GOLD NANOELECTRODE ENSEMBLES MODIFIED WITH MOLECULARLY IMPRINTED POLYMERS

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Triggered surface responsiveness paves the way for smart sensor technologies that not only have tunable recognition capability, but also provide sensing through a 'built-in' programming of the electrode material. There is also a steadily growing interest in smart recognition systems using synthetic analogs of antibodies, which offer improved stability, cost effectiveness and a means of rapid fabrication. Molecularly imprinting technology could provide a promising alternative and direct approach to determine a template used to create mimetic receptors by the formation of a specific polymer network.
A highly selective and sensitive sensor for L-arabitol is developed combining the advantages of three-dimensional nanostructrured electrodes, namely, 3D-ensembles of gold nanowires (3DNEE), with the recognition capability of molecularly imprinted polymer (MIP) [1]. L-arabitol is classified as one of the top 12 biomass-derivable building block chemicals, with low-calorific, low-glycemic, anticariogenic, and prebiotic character. In humans, abnormal concentrations of arabitol indicate the existence of infections by *Candida spp*. or other pathological conditions. The MIP/3DNEE is prepared by controlled etching of polycarbonate templated nanoelectrode ensembles, followed by electropolymerization of o-phenylenediamine on the gold nanowires in the presence of L-arabitol as a template molecule, followed by an ethanol/water mixture extraction. Electrochemical charactrization and analytically usefull signals are obtained using the ferrocenylmethytrimethylammonium cation as an electroactive probe which can access the MIP cavities, furnishing voltammetric signals which scale inversely with the L-arabitol concentration. The sensor is characterized by a low detection limit (7.5×10^{-10} mol L^{-1}) and can be applied also for quantifying L-arabitol concentration in real samples such as sugarcane vinasse.

References

[1] Beluomini M. A., Karimian N., Stradiotto N. R., Ugo P., *Sensor Actuat. B-Chem.* 2019, 284, 250.