

## Abstract

# Label-Free Aptasensor for Lysozyme Detection Using Electrochemical Impedance Spectroscopy <sup>†</sup>

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This research develops aptasensors for Lysozyme protein detection [1] using the Electrochemical Impedance Spectroscopy (EIS) technique which is simple, low-cost and follows the rapid high-sensitivity transduction principle to monitor biosensing events that take place at the surface of an electrode; the EIS technique is also capable of showing responses at a very low concentration level [2]. To achieve the main objective of this work, electrodes based on Graphite–Epoxy Composite (GECs) were constructed. The chosen immobilization technique was covalent bond using carbodiimide chemistry; for this purpose, carboxylic moieties were first generated on the graphite by electrochemical grafting.

The detection is performed using  $[\text{Fe}(\text{CN})_6]^{3-}/[\text{Fe}(\text{CN})_6]^{4-}$  as the redox marker. After recording the frequency response, values are fitted to its electric model; for this purpose, a nonlinear least-squares regression protocol with complex arithmetic using Z-view is performed using the principles of the equivalent circuit. The aptasensor showed a linear response range of 0.25  $\mu\text{M}$ –5  $\mu\text{M}$  for Lysozyme and a limit of detection (LOD) of 0.19  $\mu\text{M}$ . The sensitivity of the method established was 0.0889  $\mu\text{M}^{-1}$  in relative charge transfer resistance values.

The aptasensor can be regenerated by breaking the complex formed between the aptamer and Lysozyme using 2.0 M NaCl solution at 42 °C, showing its operation for five cycles. The main proteins' interference response, such as bovine serum albumin (BSA) and Cytochrome c (Cyt c), has also been characterized. To finally verify the performance of the developed aptasensor, it was applied to wine analysis. The developed aptasensors indicate their suitability given that they can detect Lys in a complex matrix such as wine obtaining recovery yields of 77%.

## References

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2. Vasilescu, A.; Wang, Q.; Li, M.; Boukherroub, R.; Szunerits, S. Aptamer-Based Electrochemical Sensing of Lysozyme. *Chemosensors* **2016**, *4*, 20.



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