PÔSTER - RESUMO - SENSORES E BIOSSENSORES

DEVELOPMENT OF LANGMUIR–BLODGETT LACCASE/P3HT:OCTADECYLAMINE NANO-ORGANIZED FILMS FOR ELECTROCHEMICAL DETECTION OF PHENOLIC COMPOUNDS

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Development of Langmuir–Blodgett laccase/P3HT:octadecylamine nano-organized films for electrochemical detection of phenolic compounds.

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Phenolic compounds markedly influence the sensory profile and quality of foods and beverages (e.g., wines); however, their quantification in complex matrices typically relies on time-consuming and costly analytical workflows. Here, we

report nano-organized Langmuir–Blodgett (LB) architectures for electrochemical sensing of phenolic compounds, employing laccase as the biorecognition/catalytic element and octadecylamine (ODA) and poly(3-hexylthiophene-2,5-diyl) (P3HT) as structuring and conductive components. Interfacial studies were first conducted to tailor monolayer composition and deposition conditions, enabling efficient incorporation of laccase into ODA-based films. Film stability and organization were assessed through surface pressure–area isotherms, surface compressional modulus, hysteresis analysis, kinetic stability, and complementary spectroscopic and morphological techniques. To improve film robustness and suppress P3HT aggregation, mixed P3HT:ODA (1:1) LB films were employed as the immobilization matrix, resulting in quasi-ordered coatings with low surface roughness on ITO substrates. The resulting LB-modified ITO electrodes were evaluated by cyclic voltammetry and square-wave voltammetry toward representative phenolic analytes vanillin (monophenol), catechol (diphenol), and pyrogallol (triphenol), revealing analyte-dependent electrochemical responses. Detection limits of detection of 1.55 × 10-4 M (vanillin) , 2.13 × 10-7 M (catechol), and 2.07 × 10-6 M (pyrogallol) were achieved under optimized conditions, supporting the suitability of LB nano-architectures as reproducible platforms for enzyme-based phenolic sensing. Overall, this approach provides a controllable route to organize biocatalytic interfaces and paves the way for applications in food quality assessment, authenticity monitoring, and process control.

References:

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Palavras-chave: langmuir–blodgett; laccase; p3ht; octadecylamine; phenolic compounds; electrochemical biosensor.