OF VITAMINS AND POLYMERS: ELECTROPOLYMERIZED THIAMINE FILMS AND THEIR STRUCTURE-FUNCTION RELATIONSHIPS

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Bio-derived polymers offer an attractive pathway toward sustainable functional materials, yet many biologically relevant molecules remain underexplored [1]. Thiamine (vitamin B1) is a structurally complex, redox-active heterocycle that has been widely studied electrochemically as an analyte, but rarely considered as a monomer for polymer film formation [2]. In this work, we demonstrate the direct electropolymerization of thiamine (T), lysine (L), and thiamine–lysine (LT) systems to form polymer films.

Polymer films were synthesized electrochemically while varying pH and polymerization cycles, enabling controlled tuning of film growth. Scanning electron microscopy (SEM) and atomic force microscopy (AFM) revealed pronounced differences in surface morphology depending on monomer composition. Interfacial electrochemical behavior was evaluated using the $[Fe(CN)_6]^{3-/4-}$ redox couple, while differential pulse voltammetry was employed to examine responses toward biologically relevant analytes.

The results indicate that monomer selection and co-polymerization strategies directly influence polymer morphology and interfacial function, showing the importance of structure–function relationships in bio-derived polymer films.

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