The Micro Network of Polyacrylonitrile (PAN)-polyaniline (Pani)-graphene (GRA) Hybrid Nanocomposites for Effective Electrochemical Detection of Glucose and Improved Stability

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A glucose biosensor was developed by immobilizing glucose oxidase (GOD) into the micro network of polyacrylonitrile (PAN)-polyaniline (Pani)-graphene (GRA) hybrid nanocomposite fabricated through phase inversion process. PAN with molecular weight of M_w around 2.93×10^4 was synthesized by single rare-earth catalyst- $Y(OAr)_3$ and GRA with few-layers was prepared by electrochemical expansion of graphite in propylene carbonate electrolyte, respectively. The morphologies of nanocomposites and the fabricated process of biosensor were performed by scanning electron microscopy (SEM). The cyclic voltammetry (CV) was employed to evaluate electrochemical performance of the as-prepared biosensor. The apparent activation energy (E_a) of enzyme-catalyzed reaction based on Arrhenius equation was estimated to be $16.21 \text{ kJ mol}^{-1}$. The constructed glucose biosensor exhibited a short response time within 5 s, and a superior storage stability of preserving 96.28% of the original response over a period of 2 weeks and 91.95% of that even after a month. The linear range, sensitivity, detection limit, anti-interference, and practical application were also investigated. The micro network of PAN-Pani-GRA hybrid nanocomposite provides a hopeful candidate for construction of biosensors.

Keywords: Polyacrylonitrile; Polyaniline; Graphene; Glucose biosensor.

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