Bio-Derived Graphite based Screen Printed Electrode

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Abstract

For sustainable electronics, it demands the development of "Green" conductive ink. However, water-based ink generally faces buffer stability issues. In this context, a stable Screen-printed electrode for electrochemical sensing has been developed with the aid of water-based graphite ink. In particular, bio-based oil was used for oxidative cross-linking with the pre-hydrolysed copolymer. The formulation leverages the synergy between a pre-hydrolysed anhydride-based copolymer and a specific bio-derived oil acting as a dual-function plasticiser and *in-situ* oxidative cross-linking agent. A critical thermal pre-activation step promotes the integration of a conductive polymer mediator, followed by an auto-oxidative polymerisation process that "locks" the hydrophilic binder into a water-resistant interpenetrating network. This optimised formulation has resulted in water resistance. In this context, CV measurements showed superior kinetics of electron transfer. These stable, eco-friendly electrodes offer a high-throughput, cost-effective solution for point-of-care diagnostics and environmental monitoring, aligning with the "Green Chemistry" mandate for next-generation 2D material-based devices. The electrode fabricated hence showed intra-batch reproducibility of 95%.

References

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[2] R Camargo, J.; Crapnell, R. D.; Bernalte, E.; Janegitz, B. C.; Banks, C. E. Water-Based Conductive Ink for the Production of Carbon Black Screen-Printed Electrodes and the Detection of Tryptophan. ACS Appl. Electron. Mater. 2025, 7 (12), 5599–5610. https://doi.org/10.1021/acsaelm.5c00550.

Figures

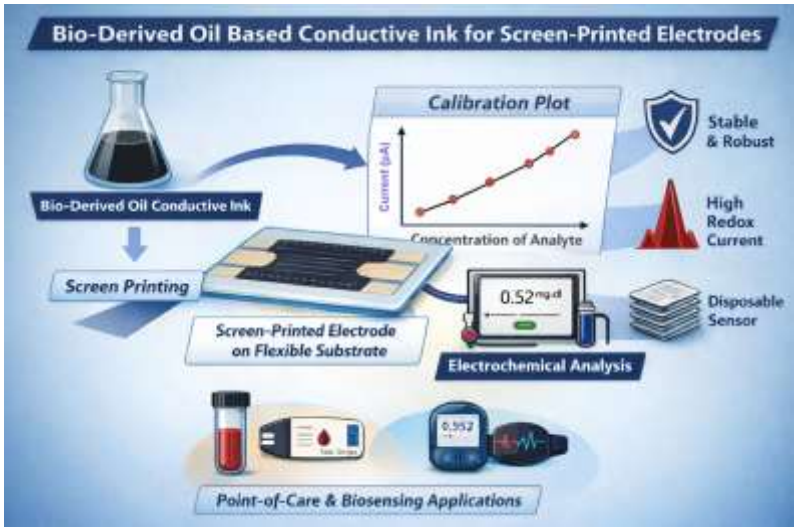

Figure 1: Graphical Abstract