ABSTRACT OF POSTER PRESENTATION

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Electrochemical Benchmarking and Reproducibility of Commercial Screen-Printed Carbon Electrodes

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Screen-printed carbon electrodes (SPCEs) have become widely adopted in electroanalytical applications due to their affordability, portability, and adaptable surface properties [1,2]. These features have enabled their extensive use in both environmental monitoring and biomedical sensing platforms [3,4]. Nevertheless, variations arising from manufacturing processes and production batches often lead to inconsistent electrochemical responses, raising concerns about data reliability and comparability [2,5]. This underscores the need for systematic evaluation strategies to assess the consistency and practical interchangeability of commercially available SPCEs.

In the present study, multiple commercial SPCEs were comparatively investigated using cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). The ferri/ferrocyanide redox system was selected as a standardized electrochemical probe [3,4] to examine key performance parameters, including electron transfer kinetics, electroactive surface area, and signal stability. The comparative analysis revealed marked differences in electrochemical behavior, reproducibility, and batch-to-batch variability, even among electrodes with similar nominal characteristics [1,5]. To complement the electrochemical measurements, morphological and compositional characterizations were performed to elucidate the origin of the observed discrepancies.

Overall, this work establishes practical criteria for the benchmarking and selection of SPCEs, supporting informed decisions when balancing electrochemical performance against reproducibility requirements in applied sensing scenarios [5,6]. In addition, preliminary investigations into surface modification approaches, such as electropolymerization, were conducted to explore routes for performance enhancement and to probe the role of surface properties in governing selectivity.

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