Laser-Scribed Graphene Electrodes for Advanced Electrochemical Biosensing: From Material Properties to Real-World Applications

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Laser-scribed graphene (LSG) electrodes are an emerging platform in electrochemical biosensing, offering a cost-effective, scalable, and highly customizable alternative to conventional electrodes. In this talk, I will highlight the fundamental advantages of LSGs in biosensing applications, with a focus on the detection of clinically relevant small molecules.
The laser-scribing process produces a nanostructured, porous graphene surface with abundant edge-plane defects and a high surface-to-volume ratio. These features significantly enhance electrochemical sensitivity by increasing electron transfer rates and improving analyte accessibility. Combined with excellent electrical conductivity and mechanical stability, these properties make LSGs ideally suited for use in sensitive, selective biosensors.
I will present a comparison between commercial electrodes and custom-fabricated LSGs, emphasizing how differences in surface morphology and material composition influence sensing performance. Case studies will include the detection of hypoxanthine and succinic acid, to demonstrate the versatility and robustness of LSG-based platforms in real-world biosensing applications.
This talk will underscore how rational electrode engineering, paired with nanostructural control, enables the development of next-generation electrochemical sensors for biomedical diagnostics.

Figures

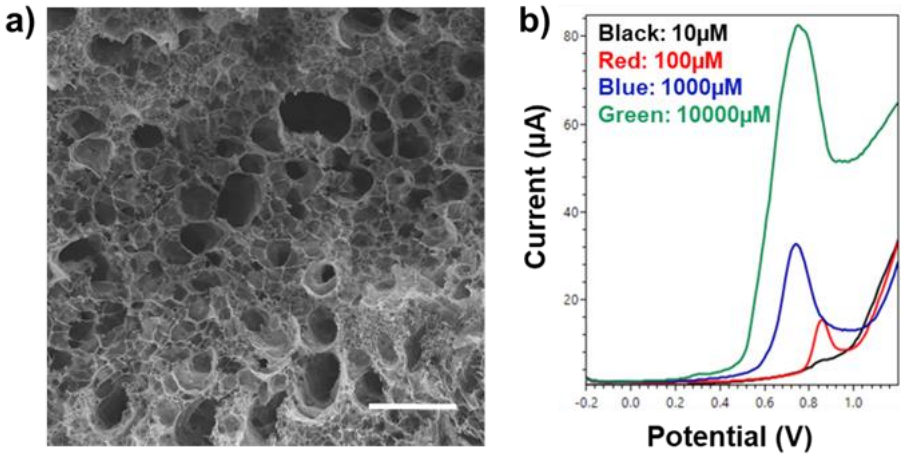

Figure 1: a) SEM image of laser scribed graphene electrodes at 20000 x magnification (Scale bar 20 um); b) Differential pulse voltammetry spectra of hypoxanthine in phosphate buffer saline (pH-7.2) at 10, 100, 1000, and 10000 uM