

# Laser-Scribed Graphene-Based Wearable Biosensor for Real-Time Monkeypox Detection in Biofluids

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## Abstract:

The increasing demand for miniaturized, non-invasive diagnostic platforms has catalyzed the advancement of wearable biosensors capable of real-time, and on-body analysis<sup>1-3</sup>. This work presents a wearable electrochemical biosensor fabricated on an aramid textile substrate using the laser-scribed graphene (LSG) technique for detecting the Monkeypox virus (MPXV). The device operates via non-faradaic capacitance measurements, detecting perturbations in the electronic density of states induced by the antigen-antibody interactions. The biosensor enables rapid testing (5 min) and exhibits excellent analytical performance, with a detection limit of  $7.5 \times 10^{-1}$  PFU mL<sup>-1</sup> and an  $R^2=0.998$  in saliva and plasma samples. Our wearable textile biosensor demonstrated high selectivity, no cross-reactivity in the presence of other pox and non-pox viruses, and adequate reproducibility (RSD = 4.57%, n=10 devices). Also, cytotoxicity assays confirmed biocompatibility of the textile-based biosensor, supporting its suitability for on-skin applications and indicating its safe use for wearable testing on skin lesions. Real-time analysis on a skin-mimicking surface highlights its suitability for the rapid diagnosis of Mpox infection. In summary, our LSG-based wearable textile biosensor for MPXV detection combines analytical robustness, biological safety, scalable production, and environmental sustainability (AGREE score = 0.76).

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## References

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