

## MoS<sub>2</sub> Flowers Grown on Graphene/Carbon Nanotubes: a Versatile Substrate for Electrochemical Determination of Hydrogen Peroxide

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Flower-like MoS<sub>2</sub> nanostructure was grown on graphene and carbon nanotubes (GR-MWCNTs) via *in-situ* hydrothermal method and the resulting composite was employed for determination of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). The MoS<sub>2</sub>/GR-MWCNTs composite was characterized by scanning electron microscopy, Energy-dispersive X-ray spectroscopy and electrochemical methods. MoS<sub>2</sub>/GR-MWCNTs possess three dimensional nanostructure, large electrochemically active surface area, porosity, and high conductivity and it was used for the enzymeless electrochemical determination of hydrogen peroxide. MoS<sub>2</sub>/GR-MWCNTs composite film modified electrode showed excellent electrocatalytic ability to the reduction of H<sub>2</sub>O<sub>2</sub>. The composite delivered significantly improved electrocatalytic ability to H<sub>2</sub>O<sub>2</sub> in comparison with control electrodes. Furthermore, the electrode exhibited low overpotential, high faradaic current and fast response time. MoS<sub>2</sub>/GR-MWCNTs composite film modified electrode responds quickly to H<sub>2</sub>O<sub>2</sub> over wide working concentration range of 5 μM–145 μM, sensitivity of 5.184 μA μM<sup>-2</sup> and detection limit of 0.83 μM. Moreover, the sensor exhibited appreciable stability, repeatability and reproducibility. Real-time application was demonstrated in biological sample which showed good recoveries. The other advantages of the fabricated biosensor are simple and green fabrication approach, roughed and stable electrode surface, fast in sensing and highly reproducible, good biocompatibility, electrocatalytic ability and excellent synergy between MoS<sub>2</sub>, MWCNTs and GR.

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**Keywords:** two dimensional layered materials, MoS<sub>2</sub>, Graphene, MWCNTs, electrochemical sensor, hydrogen peroxide, and electrocatalysis

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