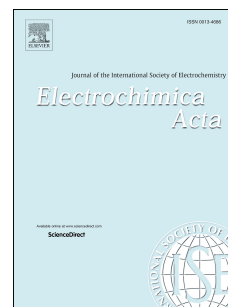


# Accepted Manuscript

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PII: S0013-4686(18)30041-0

DOI: [10.1016/j.electacta.2018.01.027](https://doi.org/10.1016/j.electacta.2018.01.027)

Reference: EA 31009

To appear in: *Electrochimica Acta*

Received Date: 22 October 2017

Revised Date: 2 January 2018

Accepted Date: 4 January 2018

Please cite this article as: L. Huang, Y. Cao, D. Diao, Nanosized graphene sheets induced high electrochemical activity in pure carbon film, *Electrochimica Acta* (2018), doi: 10.1016/j.electacta.2018.01.027.

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## Nanosized graphene sheets induced high electrochemical activity in pure carbon film

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### Abstract

We found that nanosized graphene sheets induced high electrochemical activity in pure carbon films, which prepared by electron cyclotron resonance (ECR) plasma sputtering under low-energy electron irradiation condition. The electrochemical properties were studied by electrochemical impedance spectroscopy and cyclic voltammetry. The graphene sheets embedded carbon (GSEC) films showed a wide potential window over 3.2 V. The charge transfer resistance and the oxidation-reduction peak separation ( $\Delta E_p$ ) of the GSEC films are lower than amorphous carbon films in several redox systems ( $\text{Fe}(\text{CN})_6^{4-/3-}$ ,  $\text{Ru}(\text{NH}_3)_6^{2+/3+}$ , dopamine and ascorbic acid), especially in the inner-sphere system, the  $\Delta E_p$  is only half of amorphous carbon films. The high electrochemical activity of GSEC films originated from the nanosized graphene sheets, which offered faster electron transfer path and more reaction active sites. Our results indicate the GSEC films have great potential to be an electrochemical biosensor in detecting biomolecules with high

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