

Hierarchically grown ZnFe₂O₄-decorated polyaniline-coupled-graphene nanosheets as a novel electrocatalyst for selective detecting p-nitrophenol

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Abstract:

In this work, a novel hierarchical-assembly approach was developed to co-assemble ZnFe₂O₄ NPs and graphene-coupled polyaniline (PANI@GO) nanosheets with the assistance of graphene oxide. The three-dimensional ultralight and porous ZnFe₂O₄/PANI@rGO aerogels were developed as a facile electrochemical sensor for the detection of p-nitrophenol (p-NP). The ZnFe₂O₄/PANI@rGO aerogels displayed efficient reduction ability and excellent electrochemical sensing of p-NP, attributing to the synergies between the local conductivity of the PANI@GO nanosheets and long-distance conductivity of three-dimensional graphene aerogel frameworks. The experimental results demonstrate that ZnFe₂O₄/PANI@rGO aerogels offer a good linear concentration range (1-100 μmol/L), excellent sensitivity (36.898 mA mM⁻¹ cm⁻²), stability and selectivity (<2.4 %). Overall, the developed sensor displays the excellent electrochemical performance, and the hierarchical-assembly could afford a distinctive method for the fabrication of three-dimensional sandwich-like structured ternary nanocomposites with versatile applications.

Biography: Wei Wei currently works at the Physical Chemistry, Department of Chemistry and Food Chemistry, Technische Universität Dresden. As a visiting scholar, Dr. Wei does research in Aerogel Group under the supervision of the professor Alexander Eychmüller. His research interest focuses on design of hybrid aerogel composites for clean energy utilization.

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References:

- [1] A. G. Hufnagel, K. Peters, A. Müller, C. Scheu, D. Fattakhova-Rohlfing, T. Bein, *Advanced Functional Materials*, 2016, 26(25), 4435-4443.
- [2] B. S. Khened, M. V. N. Prasad, M. Sasikala, *Sensor Letters*, 2016, 14(8), 817-823.
- [3] C. Wang, X. Chen, B. Wang, M. Huang, B. Wang, Y. Jiang, R. S. Ruoff, *ACS Nano*, 2018, 12(6), 5816-5825.
- [4] A. G. Tabrizi, N. Arsalani, A. Mohammadi, L. S. Ghadimi, I. Ahadzadeh, *Journal of Colloid and Interface Science*, 2018, 531, 369-381.
- [5] R. Mahmoodi, M. G. Hosseini, H. Rasouli, *Applied Catalysis B: Environmental*, 2019, 251, 37-48.