Bifunctional Oxygen Electrocatalysts- Manganese Anchored with Holey Graphene-Nickel Disulfide

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Abstract

The ever-increasing energy demands of modern society force us to search for alternative energy storage and conversion systems due to the depletion of fossil fuel in the earth crust and to control environmental problems. The two key electrochemical processes such as oxygen evolution reaction (OER) and oxygen reduction reaction (ORR), play dominant roles in water-splitting devices, rechargeable fuel cells, and metal-air batteries. Presently, PGM-based electrocatalysts are widely used, however, it has serious problems for large-scale potential applications due to of its high-cost and less availability.[1] Therefore, it is important to develop effective, earth-abundant, and non-noble bifunctional electrocatalysts with high activity. For further improvement, carbon is an effective source to enhance the electrochemical performance of electrodes since it has high electrical conductivity, leads to improve the conductance of composite materials and increases the stability of the electrodes.[2]

Hence, we prepared a low-cost transition metal-sulfide embedded in holey graphene (M–HG, M= Ni) towards electrocatalytic activity towards the ORR and OER reaction that is essential for diverse clean energy technologies including water splitting and rechargeable metal-air batteries. Further, we also investigated the effect of Mn doping with NiS_2/HG composites and measured the electrochemical properties. The ORR and OER activity were examined by LSV in 0.1 M KOH solution, moreover, regarding the overall electrocatalytic activity, the potential difference of optimized Mn-doped NiS_2 was 0.84 V vs RHE.

References

1. *Sun et al., Science 356, 599-604 (2017).*
2. *Fei et al., Nature catalysis 1, 63-72 (2018).*