Low Temperature Green Synthesis of Sulfur-Nitrogen Co-Doped Graphene as Efficient Metal-Free Catalysts for Oxygen Reduction Reaction

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doi: 10.20964/2017.04.67

Received: 12 January 2017 / Accepted: 23 February 2017 / Published: 12 March 2017

Development of inexpensive and scalable cathode catalysts that can efficiently catalyze the oxygen reduction reaction (ORR) is of significance in practical application of fuel cells. Heteroatom doped carbons have been recognized as the promising candidate. Herein sulphur-nitrogen co-doped reduced graphene oxide (S-N-rGO) was prepared through low-temperature refluxing with sodium sulfide, ammonia and graphene oxide as the precursors. The catalytic performance of the fabricated S-N-rGO towards the ORR was assessed by electrochemical test. The effect of reaction temperature on catalytic activity was also studied. The S-N-rGO gained under the reaction temperature of 150 °C (S-N-rGO-150 °C) demonstrates higher electrocatalytic activity and mainly four electron ORR process in alkaline condition. In addition, it also shows improved durability and better resistance toward methanol. The excellent performance for the ORR on S-N-rGO is attributed to the synergistic effect originating from the doped S and N in the graphene sheets.

Keywords: co-doped; graphene; oxygen reduction; electrocatalysis; durability

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