Iron nitride loaded carbon nanotube –graphene composite (Fe_2N/nCNT-GR) for Oxygen reduction reaction

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Polymer electrolyte membrane fuel cell(PEMFC) are attractive devices among next-generation eco-friendly generators due to high energy conversion efficiency, high power density and eco-friendly. High cost platinum catalysts are used as the cathode and anode catalysts, which is a major weakness of the fuel cell. Further, oxygen reduction reaction(ORR) in cathode reaction PEMFC is sluggish and corrosive. This cause large amounts of Pt needed and stability is also problematic. In order to commercialize a fuel cell, it is essential to develop catalysts which are stable in Oxygen reduction reaction and can be substituted for a noble metal catalyst. Accordingly, many non-Pt catalyst is reported for ORR including transition metal-nitrogen-carbon electrocatalysts(MNx/C) [1][2][3], heteroatom-doped carbon based catalysts [4], transition metal carbides, nitride and oxynitrides catalysts [5][6], Metal chalcogenides [7].

Recently, Honggang Fu at al [8]. was reported that Fe_2N nanoparticles and nitrogen-doped graphitic nanosheets composites (Fe_2N–NGC) have been synthesized by an ion-exchanged route. Fe_2N–NGC exhibited greatly enhanced electrocatalytic activity and stability towards ORR.

Here, we report an efficient ORR electrocatalysts composed of Fe_2N/nCNT-GR. By a simple synthetic method called urea-glass route was applied to Fe_2N [9]. Through the synthesis, Fe_2N/nCNT-GR was prepared well, and it was confirmed through various analysis Synergistic effect between active Fe2N particle and CNT-GR possessing large mesopores and high electrical conductivity were attributed to increased ORR catalytic activity. Especially, 3-D like CNT-GR structure assembled between 2-D GR and 1-D CNT provides large mesopores, it can be easily accessed by electrolyte. Therefore, Fe_2N/nCNT-GR showed good ORR activity.

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