

Convenient method for the preparation of N-doped CNTs and the effects of iron content in oxygen reduction reaction

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To investigate the effects and roles of iron content, N-doped CNTs grafted on Fe/C were synthesized via the pyrolysis of a mixture comprising dicyandiamide and various contents of Fe₂O₃/C (0, 20, 40 and 60 wt%). From the results of electrochemical tests (CV and ORR), the catalyst with the highest performance was observed when dicyandiamide was pyrolyzed with Fe₂O₃/C 20 wt% (Fe-N-C-20) and the order of activity towards ORR was Fe-N-C-20 > Fe-N-C-40 > Fe-N-C-60 > Fe-N-C-0 > Vulcan XC-72R. It was shown that the iron does not act as an active site for ORR, but as a stimulator in doping nitrogen into carbon; as the iron content increased, the amount of nitrogen doping also increased. However, increment of iron content had negative effects on the catalysts for ORR due to a decrease of the surface area of the prepared catalysts, and as a result the activity towards the ORR as a function of the amount of iron content graphically followed a volcano-like shape.