Cobalt and Nitrogen Co-doped Porous Carbon Spheres as Efficient Oxygen Reduction Electrocatalysts

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In this paper, cobalt and nitrogen co-doped carbon sphere catalysts were synthesized by two methods, electrospinning and grinding. The two kinds of Co,N co-doped carbon sphere catalysts were compared in a system. According to the results, Co-N-C-37.5 catalyst has a better oxygen reduction reaction (ORR) performance and a more spherical shape than the other catalysts. Additionally, it has the largest specific surface area of all tested electrocatalysts. For the electrochemical activity, the onset potential (E_{onset}) of Co-N-C-37.5 is 0.979 V, which is better than that of the commercial Pt/C catalyst (0.967 V). The half-wave potential ($E_{1/2}$) of Co-N-C-37.5 is 0.780 V, which is slightly lower than that of the commercial Pt/C (0.797 V). After 10,000 s of durability testing, 88% of current is retained with Co-N-C-37.5, which is better than that of commercial Pt/C (83%). In addition, the methanol tolerance of Co-N-C-37.5 is better than that of the commercial Pt/C. The current density percentage of Co-N-C-37.5 has no distinct decrease after the addition of methanol at 500 s. However, the commercial Pt/C decreases sharply. Therefore, this study provides a facile way to produce Co, N co-doped carbon sphere catalysts with good catalytic performance for the ORR.

Keywords: Electrospinning; Co, N co-doped; Carbon sphere; Oxygen reduction reaction

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