Synthesis of Bimetallic ZIF-derived Co@CNT Electrocatalyst with Hollow Shell Structure for Oxygen Reduction Reaction

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Zeolitic imidazolate frameworks (ZIFs) are porous hybrid materials, which have unique properties such as high surface area, tunable pore structure with high thermal and chemical stability. ZIFs, a subclass of MOFs, are composed of zinc or cobalt ions and imidazolate linkers. In this study, bimetallic ZIFs spheres with hollow structures were prepared from PS/ZIFs core-shell particles and used as catalyst templates to enhance the mass transfer characteristics. Also, nitrogen-doped carbon nanotubes were synthesized from bimetallic ZIFs, resulting in Co@CNT electrocatalysts with hollow shell structure, which exhibited excellent electrocatalytic activity and stability in oxygen reduction reactions. Significantly improved electrochemical properties of Co@CNT catalysts were probably due to the synergistic effects of crystalline nitrogen-doped carbon nanotubes in hollow structure with well dispersed Co species. The catalytic activity was maximized after the leaching process in acidic solution. This new approach suggests a potential way for synthesis of MOF-derived functional nanomaterials with controlled design such as highly active electrode catalysts in electrochemical energy devices