

Carbon Materials Assisted Designs of Electrocatalysts

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Abstract

Electrocatalysts are critical for realizing efficient energy conversion processes. Carbon materials can serve as excellent substrates for metal/metal oxide and other catalysts or act as metal-free catalysts themselves. Here we introduce our efforts in designing novel electrocatalysts for water splitting and zinc-air batteries with the assistance of carbon materials. First, nitrogen-containing polymers and metal-organic frameworks were carbonized under controlled conditions to yield nitrogen doped porous carbon materials for oxygen reduction reaction (ORR) or water splitting.[1-3] Second, we showed that biomaterials containing proteins, such as microbes or milk powders, are cost-effective precursors to produce nitrogen and phosphor dually doped carbon materials, which can act as electrocatalysts themselves or work as substrates for metal oxide based catalysts for ORR, hydrogen evolution reaction (HER), and zinc-air batteries.[4-7] Last, we demonstrate that carbon nanomaterials, such as graphene oxide, carbon nanotubes, and their hybrids, can be tailored to assist the synthesis of structurally controlled metal oxides, metal borides, and metal nanoparticles. They can also create synergetic efforts to boost the catalyst activity. [8-11]

References

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