High-Performance N-doped Bifunctional Carbon Electrocatalysts Derived from Polymer Waste for Oxygen Reduction and Evolution Reaction

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Developing novel bifunctional heteroatom-doped carbon electrocatalysts for the oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) is vital for the development of fuel cells, metal-air batteries and water oxidation systems. Herein, a nitrogen (N)-containing polymer waste was collected and used to synthesize N-doped bifunctional carbon electrocatalysts (N-BCEs). The results indicated that the N-containing polymer waste from a living environment can be converted to N-BCEs easily. In addition, the surface areas, pore structures and N doping contents of N-BCEs were further optimized by cyanoguanidine. Most importantly, the electrochemical tests demonstrated that the as-prepared N-BCEs exhibited comparable ORR and OER activities to the commercial noble-metal Pt-C and IrO₂ electrocatalysts in both acidic and alkaline media, indicating that environmentally-unfriendly heteroatom-containing polymer wastes can be utilized to synthesize advanced heteroatom-doped BCEs for ORR and OER in future fuel cells, metal-air batteries and water oxidation.

Keywords: N-containing polymer wastes; bifunctional electrocatalysts; oxygen reduction reaction; oxygen evolution reaction; electrocatalysis

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