A Cheap Polypyrrole-Derived Fe-N-C Electrocatalyst with Ultrahigh Oxygen Reduction Activity in Alkaline Electrolyte

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Ternary Fe-N-C catalysts are regarded as the most promising candidates for low-cost alternatives to the Pt-based materials for catalyzing the oxygen reduction reaction (ORR). In this paper, the Fe and N co-doped carbon catalyst (Fe-Py@K-800) with the unique foam-like 3D structure has been fabricated by using the molecular sieve as a new solid-state template. The results of physical characterization indicate that Fe atoms are coordinated with nitrogen atoms to form the Fe-N ORR-active structure. In contrast with the commercial Pt/C catalyst, the Fe-Py@K-800 displays a comparable ORR electrocatalytic activity with an onset potential of ~1.1 V and a half-wave potential of ~0.88 V (vs. RHE), however, the long-term stability of Fe-Py@K-800 is obviously better. These results show that iron-organic coordination in the pyrrole ring will play a role in the generation of nitrogen-rich active sites, which facilitates the enhancement of ORR activity in alkaline electrolyte.

Keywords: Porous carbon, Oxygen reduction, Electrocatalyst, Molecular sieve

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