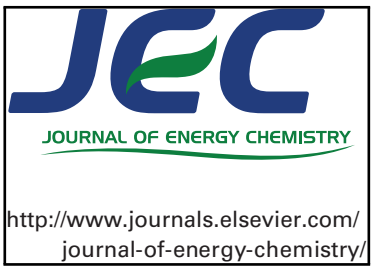

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Highly efficient iron-nitrogen electrocatalyst derived from covalent organic polymer for oxygen reduction

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ABSTRACT

Developing non-precious metal catalyst with high activity, good stability and low cost for electrocatalytic oxygen reduction reaction (ORR) is critical for the wide application of energy conversion system. Here, we developed a cost-effective synthetic strategy via silica assistance to obtain a novel Fe_3C/Fe-N_x-C (named as COP_{BP-PB}-Fe-900-SiO_2) catalyst with effective active sites of Fe-N_x and Fe_3C from the rational design two-dimensional covalent organic polymer (COP_{BP-PB}). The nitrogen-rich COP effectively promotes the formation of active Fe-N_x sites. Additionally, the silica not only can effectively suppress the formation of large Fe-based particles in the catalysts, but also increases the degree of carbonization of the catalyst. The as-prepared COP_{BP-PB}-Fe-900-SiO_2 catalyst exhibits high electrocatalytic activity for ORR with a half-wave potential of 0.85 V vs. reversible hydrogen electrode (RHE), showing comparable activity as compared with the commercial Pt/C catalysts in alkaline media. Moreover, this catalyst also shows a high stability with a nearly constant onset potential and half-wave potential after 10 000 cycles. The present work is highly meaningful for developing ORR electrocatalysts towards wide applications.