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The effect of N precursors in Fe-N/C type catalysts based on activated silicon carbide derived carbon for oxygen reduction activity at various pH values

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ABSTRACT

Simple and modified synthesis route for preparation of Fe-N/C type oxygen reduction reaction (ORR) catalysts has been worked out and discussed. The significant effect of the N precursor chemical composition on the ORR activity in 0.1M KOH and 0.1M HClO₄ electrolyte solutions has been demonstrated. The half-wave potential values increased in the following order: C(SiC) < Fe+Urea/C < Fe+EDTA/C < Fe+DIPO/C ≤ Fe+Phen/C ≤ Fe+Bipyr/C in both electrolyte solutions studied. Molar ratio of Fe:N precursor and Fe content change in the Fe+Bipyr/C catalyst was found to be negligible. Noticeable change in ORR activity has been observed after acid treatment step of Fe+Bipyr/C. The 150-hour durability tests demonstrated that in terms of the activity/stability ratio the Fe+Phen/C is the best ORR catalyst.

1. Introduction

Extensive research has been devoted for the development of non-noble ORR catalysts, such as metal and nitrogen co-doped carbon materials. For the time being, it has been shown that heat treated Fe and N precursor complexes adsorbed on the carbon support generate the ORR catalysts with high activity and stability [1-8]. It has been shown that the Fe content and Fe:N precursor molar ratio as well as the type of N precursor itself notably affects the ORR

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