

The Effect of Pt-clusters decorated Ni_{core} SnPd_{shell} Nanocatalyst with Active Carbon Support for Oxygen Reduction Reaction in Alkaline Medium

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Abstract

The high cost of Pt used in electrocatalysts pose obstacles to the commercial viability of fuel cell in ORR (Oxygen reduction reaction) at the cathode. In order to develop low-cost ORR catalysts with low noble-metal loading but high activity, we designed model catalysts of small Pt-3 clusters-decorated core-shell structures. Active Carbon (AC) supported quaternary metallic nanocatalyst (NC) is synthesized by using a wet chemical reduction method with the configuration of Ni_{core}@SnPd_{shell} and with different ratios of Pt concentration on the top (namely Ni@SnPd-Pt or NSPP). Our results show an assessment for programming the ORR performance by Pt loading control in the NCs. It shows that the ORR activity of NSPP NPs is improved by 80-folds relative to a commercial Pt NC (J.M.-Pt/C). The effect of atomic structure and ORR performance has been elucidated by the results of electrochemical analyses, X-ray diffraction (XRD) and X-ray absorption spectroscopy.

Keywords : *Oxygen reduction reaction, electrocatalyst, nanocatalyst, wet chemical reduction method*