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Comparative Study on the Catalytic Activity and Stability between Pt-Decorated Ru surfaces and Ru-Decorated Pt Surfaces Catalysts for Methanol Electrooxidation

PtRu bimetallic nanocatalyst has been accepted as an effective catalyst for methanol fuel cells. However, there has been a constant effort for their commercial development. This work, the correlation between the surface structure of PtRu bimetallic nanocatalyst and their methanol electro-oxidation activity was studied. Pt-decorated Ru core-shell nanocatalyst ($Pt@Ru$) and Ru-decorated Pt core-shell nanocatalyst ($Ru@Pt$) were prepared by successive reduction. Firstly, the Pt^0 or Ru^0 particles were prepared by polyol process. Then, the reaction involved the reduction of the metal salts into atoms and decoration on the core particles. Different ratios of the core to shell were controlled synthesis by controlling the reaction conditions. The particle size shape and morphology of the obtained core-shell nanoparticles were analyzed by TEM. The crystal structure and surface structure of the samples were characterized by XRD and CO adsorption probe technique, respectively. The methanol electro-oxidation performance of the bimetallic catalysts was determined by cyclic voltammetry. The maximum activity of the Pt@Ru core-shell sample was obtained with Pt to Ru ratio of 3:1 while of 1:2 for Ru@Pt core-shell. The stability of Ru@Pt core-shell catalyst determined by chronoamperometry was found higher than Ru@Pt core-shell catalyst.

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