

Effect of heat treatment on PtRu/C catalyst for methanol electro-oxidation

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The effect of heat treatment on a commercial PtRu/C catalyst was investigated with a focus on the relationship between electrochemical and surface properties. The heat treated PtRu/C catalysts were prepared by reducing the commercial PtRu/C catalyst at 300, 500, and 600 °C under hydrogen flow. The maximum mass activity for the methanol electro-oxidation reaction (MOR) was observed in the catalyst heat treated at 500 °C, while specific activity for the MOR increased with increasing heat treatment temperature. Cyclic voltammetry (CV) results revealed that the heat treatment caused Pt rich surface formation. The increase in surface Pt was confirmed by X-ray photoelectron spectroscopy; the surface (Pt:Ru) ratio of the fresh catalyst (81:19) changed to (87:13) in the 600 °C heat treated catalyst. Quantitative analysis of the Ru oxidation state showed that the ratio of metallic Ru increased with an increase in heat treatment temperature. On the other hand, RuOxHy completely reduced at 500 °C and the ratio of RuO2 slightly decreased with increasing heat treatment temperature.