

## **A study of Au/C nanoparticles with Pt monolayer and sub-monolayer Electrocatalysts for Ethanol Oxidation Reaction**

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Effective utilization of the high energy density of ethanol as a fuel for polymer electrolyte fuel cells is contingency upon complete oxidation of ethanol to carbon dioxide. Major problems associated with the development of electrocatalysts for ethanol oxidation are the high content of Pt and partial oxidation of ethanol to acetaldehyde and acetic acid instead of complete oxidation to carbon dioxide via the 12- electron process. Despite extensive work on ethanol oxidation catalysts, it is difficult to get C-C bond splitting without compromising on the Pt content. In this report, Au/C nanoparticles with Pt monolayer: Au/C@Pt(II) and sub-monolayer: Au/C@Pt(IV) were studied as electrocatalysts for ethanol oxidation reaction (EOR). Au/C@Pt(II) and Au/C@Pt(IV) were synthesized using a Cu mediated electrochemical method. Electrochemical testing of these electrocatalysts showed that Au/C@Pt(II) had substantially higher activity towards EOR than Au/C@Pt(IV). The effect of Pt cluster sizes on the Au surface and the tensile strain on Pt due to the underlying Au and their effect on EOR will be discussed. The mechanism of EOR on these electrocatalysts was also studied using *in-situ* FTIR to investigate the complete or partial oxidation of ethanol