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Synthesis of Anode Materials for DMFC
DMFC 음극재료의 합성

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The potential anode materials for direct methanol fuel cells were prepared by reduction of metal ions onto carbon support and ballmilling of metal powders. The carbon supported Pt/C, $PtWO_X/C$, PtRu/C, $PtRuWO_X/C$ and $PtRuMoO_X/C$ catalysts were prepared by chemical reduction of the metal materials on carbon black support. The tungsten was present in the form of oxide, WO_X, and the role of WO_X/C on the electrochemical oxidation reaction of CH_3OH on the catalysts was investigated. The CO stripping on $PtWO_X/C$ catalyst showed higher oxidation current than on Pt/C catalyst between the potential range of 0.4 and 0.3 V vs. Hg/H_2SO_4. The $PtWO_X/C$ catalyst produced higher methanol oxidation rate per electro-active Pt sites at the same potential range. The $PtRuWO_X/C$ catalyst showed higher methanol oxidation current for all investigated potential range between -0.15 V and + 0.25 V. The Pt and Mo based powder prepared by ballmilling was also tested as a potential catalyst for the electrochemical oxidation reaction of methanol. The powder catalysts aggregated and formed particles that ranged from sub-microns to several microns in size. STM image of the surface of the particles showed that the powder catalysts were formed from aggregation of 2-3 nm particles. XRD spectra of the powder also indicated the presence of 2 nm crystallites. Electrochemical studies carried out in 1 M CH_3OH and 0.5 M H_2SO_4 solutions suggested that the Pt-Mo powder containing 10 atomic % of Mo yielded the highest methanol oxidation current that was twice of the value observed for pure Pt catalyst. The excess Mo was found to hinder the methanol oxidation reaction on Pt.