

Highly active PtRuFe/C catalyst for methanol electro-oxidation

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Novel PtRuFe/C (2:1:1 at.%) catalyst was synthesized by a NaBH_4 reduction method. By TEM, particle size of the PtRuFe/C catalyst was determined to be 2.6 nm. Mass and specific activities for methanol electro-oxidation obtained in a 1 M H_2SO_4 + 1 M MeOH solution electrolyte were 5.67 A/g catal. and 177 mA/m^2 for the PtRuFe/C catalyst, while those of the commercial PtRu/C catalyst were 2.28 A/g catal. and 87.7 mA/m^2 , respectively. Incorporation of Fe could lower CO electro-oxidation on-set voltage which was proven by CO stripping analysis results. From XRD and XPS results, it was found that Fe_2O_3 was formed instead of Fe(0), which resulted in large electron deficiency in Pt and easy CO electro-oxidation. From XPS results, shift of Pt4f peaks to higher binding energies in PtRuFe/C than PtRu/C proved that electron deficiency of Pt was caused by incorporation of Fe.