Decomposition of methanol on Rhodium and Rhodium-Gold alloy nanoclusters supported by Al_2O_3/NiAl(100)

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Abstract

We studied decomposition of methanol on Rh and Rh-Au nanoclusters supported on thin film Al_2O_3 under near-ambient pressure with X-ray photoelectron spectroscopy (XPS) and quadrupole mass spectrometer (QMS). The catalyzed decomposition of methanol has been widely studied since the reaction is applied to direct methanol fuel cells (DMFCs) and also serves as a source of hydrogen. In order to improve the performance of DMFCs and related products, understanding of a correlation between reactivity and structure of the catalysts is necessary. Rh and Rh-Au nanoclusters under near-ambient condition serves as realistic model system to understand the reaction in real world. Rh nanoclusters catalyze methanol decomposition and Au nanoclusters exhibit reactivity for CO oxidation. The Rh-Au nanoclusters might have a bi-functional mechanism and synergistic effects. The comparison of results of Rh and Rh-Au clusters is discussed in this poster. Rh clusters exhibited size dependence toward methanol decomposition. With decreasing of Rh deposition, production of reaction per surface site increases. The results are also compared to those obtained under ultrahigh vacuum conditions.

Keywords - methanol decomposition, rhodium, rhodium-gold alloy, APXPS