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# CO Adsorption/Desorption Effects on the Particle Size and Surface Morphology of Pt-black and Carbon Supported Pt Studied by NMR, TEM and CV Techniques

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The effect of CO adsorption/desorption on the Pt particle size and surface morphology of Pt-black (100% Pt) and Pt supported on high surface area carbon (Pt/C) was investigated by cyclic voltammetry (CV), transmission electron microscopy (TEM) and $^{13}C$ nuclear magnetic resonance spectroscopy (NMR). CO on Pt surface is one of major reason of reducing the activity of supported Pt catalysts. So removing CO on Pt surface is necessary and then the Pt particle size and surface morphology would be changed. The samples prepared by cleaning at 250 mV (vs. 1 M Ag/AgCl reference) and successive CO adsorption at 0 mV by partial oxidation of methanol in solution and desorption at 450 mV in 0.6 M $CH_3OH$/ 0.5 M $H_2SO_4$ solution until the current was reduced below +200 $\mu$A. The Pt particle size increases in 20%, 40% Pt/C and does not changed in 100% (Pt-blacks). In contrast, it decreases in 60% Pt/C. The $^{13}C$ chemical shift ($\delta_G$) of CO on Pt/C samples shows size dependence. The linewidths become much narrower due to reduced distribution of CO on each adsorption site in 20% and 40% Pt/C as Pt particle size increases, however, the spectral linewidths of 60% and 100% Pt/C do wider. Our results show that CO adsorption and desorption processes can modify the Pt particle size and surface condition. On the basis of the present results, CO adsorption/desorption effects on Pt particle size and surface morphology should be considered when Pt/C is used as electrocatalysts.