

## **Influence of Metal Cleaning on the Particle Size and Surface Morphology of Pt-black and Pt/C Studied by NMR, TEM and CV Techniques**

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Cyclic voltammetry (CV), transmission electron microscopy (TEM) and  $^{13}\text{C}$  nuclear magnetic resonance spectroscopy (NMR) were employed to investigate the particle size and surface morphology of Pt-black and Pt/C samples as received and prepared under several cleaning methods. The Pt particle grow mostly by extensive CV treatment and moderately by holding the potential at 250mV (vs. 1 M Ag/AgCl reference electrode) in both samples. CV, even single anodic sweep, can affect to Pt surface atom. The  $^{13}\text{C}$  chemical shift ( $\delta_{\text{C}}$ ) of CO on Pt-black is largely up-field shifted due to its LDOS decrease as particle size increases. Contrary to this, it remains the same for the Pt/C samples suggesting that LDOS is independent of Pt particle size from its metal support interaction. Our results show that a cleaning process and detecting method of its effect should be chosen with knowledge of its effect on metal surface and particle size.