An Investigation of Structure Change in PtCo/C Bimetallic Nanoparticles during Acid Treatment

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The commercial carbon supported Pt-Co alloy nanoparticle catalysts of nominal atomic composition were subjected to acid treatment in order to induce structural change in the catalyst. The corresponding structural change in the catalyst was studied by x-ray absorption spectroscopy (XAS) techniques. The sample used was the ETEK 30% PtCo supported on carbon. As the acid will etch the catalyst during the oxidation, the surface Co-Co bond will be dissolved.

Figure 1 shows the FT-EXAFS spectra at the Co K-edge. From the Co K-edge best fitting parameters, the Co-Co bonding starts to decrease when acid treatment time increased to 30min. After that, the bonding of Co-Pt appears to decrease

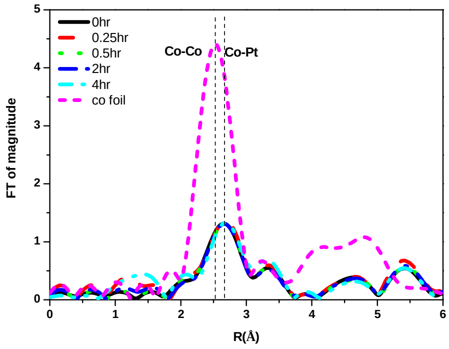

Figure 1. FT EXAFS spectra at Co K-edge

As the intensity of Co-Co and Co-Pt dissolution increases the structure of the catalyst surface will be unstable and Pt-Pt will be dissolved in the sulfuric acid. The FT-EXAFS spectra at the Pt L_{III}-edge were shown in Fig. 2. From the best fitting parameters we found that at 2 h acid treatment lead to the Pt-Pt dissolution in acid. By using this approach, it can be easy to generate the Co_{core}–Pt_{Shell} structures from the PtCo alloy system.

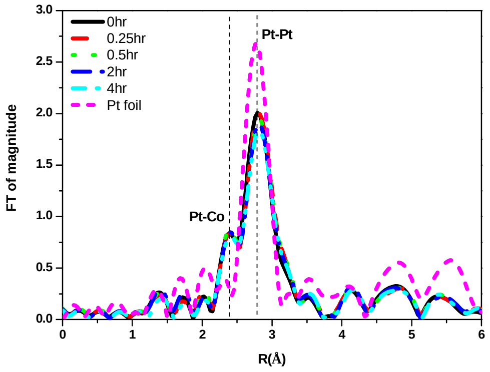

Figure 2. FT EXAFS spectra at Pt L_{III}-edge