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EX-SITU EXAFS INVESTIGATION OF ZEOLITE SUPPORTED Pt ELECTROCATALYST STRUCTURE

Jun Yao[1] and Yufeng Yao[2]

[1] University of Lincoln, Brayford Pool, Lincoln LN6 7TS, UK, jyao@lincoln.ac.uk

[2] University of the West of England, Coldharbour Lane, Bristol BS16 1QY, UK, Yufeng.Yao@uwe.ac.uk

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ABSTRACT:

The electrochemical performance of zeolite supported 1.5 wt% Pt electrocatalyst in fuel cell has been discussed in previous studies [1, 2]. This work will focus on investigating the influence of Pt loading and Pt deposition methods on Pt electrochemical performance and Pt particle size under different thermal treatment conditions. Both the 1.5 wt% and 5 wt% Pt loading on zeolite electrocatalyst were made in-house by $Pt(NH_3)_4(NO_3)_2$ salt or $Pt(NH_3)_4(NO_3)_2/NH_4NO_3$ salt with ion exchanged method and calcined at 350°C and then reduced at 400°C or direct reduced at 400°C, respectively. The cycle voltammetry measurement depicts a slightly high current change in hydride region for electrocatalyst under direct reduction at 400°C, with a shifted peak current towards positive potential region. This indicates that the energy level for hydrogen adsorption and desorption on Pt surface is higher in comparison to those electrocatalysts made by calcinations and reduction at 400°C. The extended X-ray adsorption fine spectroscopy measurement has revealed that the Pt nanoparticle size for electrocatalyst made by $Pt(NH_3)_4(NO_3)_2/NH_4NO_3$ or $Pt(NH_3)_4(NO_3)_2$ calcined and reduced at 400°C is smaller compared to those made by direct reduced at 400°C. The Pt nanoparticle size for 1.5 wt% Pt loading on zeolite is generally smaller than that for 5 wt% Pt loading electrocatalysts. The hydrogen spillover and surface conductance might be adopted to explain electrochemical performance presented by the Pt zeolite electrocatalyst.

References:

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