Experimental and computational approach to electrocatalyst performances of Pt supported carbon nanoribbon oxides and carbon nanoribbons for fuel cells

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Carbon nanoribbons (CNRs) have good properties as support materials, which is able to homogeneously dispersed nanoparticle by its large surface area. In this paper, carbon nanoribbon oxides (CNROs) and carbon nanoribbons (CNRs) were employed as electrocatalyst supports for fuel cells. The catalytic activity and durability of Pt nanoparticles supported CNRO (Pt/CNRO) and CNR (Pt/CNR) were verified by electrochemical experiments, and clarified by Density Functional Theory (DFT) calculations to obtain reliable electronic structure properties. The 20/40/60wt% of Pt nanoparticles was chemically synthesized onto CNROs and CNRs. The catalytic activities of these electrocatalysts were studied with Rotating Disk Electrode (RDE) in 0.1M HClO4 media, as well as the durability was investigated before and after 10,000 potential scans in Cyclic Voltammetry (CV). By applying the DFT calculations, we elucidated the catalytic activity, investigating electronic structure of the Pt nanoparticles on CNROs and CNRs. The dissolution potential of Pt nanoparticles on supports was calculated to explain the thermodynamic durability.