Way of single walled carbon nanotube hydration via polymer wrapping for application in the proton exchange membrane fuel cell

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Single-walled carbon nanotube (SWNT) is considered as one of the promising support materials for platinum-based catalyst in the proton exchange membrane fuel cell (PEMFC) owing to its superior durability compared to the carbon black. However, the SWNT severely aggregates in the hydrophilic solvents such as alcohol and water, which limits the application to the catalysts for the PEMFC. To address this issue, the procedure of the polymer wrapping on the SWNT was investigated to improve the dispersion state of SWNT. Specifically, dimethylformamide (DMF) was used as dispersing solvents and different rotating speeds were 5,000 rpm, 7,500 rpm, and 10,000 rpm. The high-resolution transmission electron microscopy equipped with the energy dispersive X-ray spectroscopy (EDX) was employed to measure the degree of polymer wrapping on the SWNT. As a result, the rotating speeds was optimized 7,500 rpm because at 7,500 rpm obtain higher sulfur atomic % compared with 5,000 and 10,000 rpm via EDX result. Therefore, the polymer-wrapping SWNT at 7,500 rpm was well dispersion in hydrophilic solvent more than pure SWNT because sulfur wrapped surface.