

Solvent effect on the performance of proton exchange membrane fuel cell using Electrostatic Spray Deposition (ESD) method

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Electrostatic Spray Deposition (ESD) is a process which the solution is ejected from metal syringe nozzle by applied high voltage between the nozzle and the substrate. By this process, the ESD has potential of fabrication of electrode with ultra-low platinum loading. The dispersion ink of Pt/C (HSPEC 3000), Nafion solution (D521) and DMF solvent has been electro-sprayed over gas diffusion layer (GDL) and Nafion membrane 212 with 0.02 mg/cm² to prepare the membrane electrode assembly (MEA) for proton exchange membrane fuel cell (PEMFC). Thermogravimetry Analysis (TGA) was examined to analyze platinum loading in Nafion membrane. Additionally, the current-voltage curves of MEAs were compared and showed that MEA sprayed on GDL is 0.8 A/cm² at 0.5 V is higher than the results which sprayed on Nafion membrane (0.16 A/cm² at 0.5 V). This may cause DMF solvent defects on Nafion membrane and makes Nafion membrane dissolution.