

Preparation and characterization of carbon composite paper from coconut coir for gas diffusion layer

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Abstrak

The gas diffusion layer (GDL) is one of the critical components of a proton exchange membrane fuel cell (PEMFC). It is generally made of a fossil-fuel-based carbon material. In this study, carbon composite paper (CCP) for GDL was prepared by using carbon material obtained from coconut coir. To obtain the CCP, 80 wt% carbon material from the coconut coir and 20 wt% polymer binder (ethylene vinyl acetate and polyethylene glycol) were mixed in xylene solvent at 100°C, cast on molded glass, and then rolled. The carbon material consists of a mixture of carbon fibers (length: 2 mm) and powders (size: 74 µm). Subsequently, the CCP was treated with polytetrafluoroethylene solution (10 wt%). The physical properties of the CCPs, such as through-plane electrical conductivity, porosity, density, and hydrophobic properties, were investigated. Scanning electron microscopy and energy-dispersive spectroscopy mapping were used to analyze the morphology and polytetrafluoroethylene (PTFE) distribution in the CCP. The through-plane conductivity test showed that CCP with 70 wt% carbon fiber, 10 wt% carbon powder, and 20 wt% polymer was the optimum sample, and it showed the highest electrical conductivity of 2.22 S cm⁻¹. The physical properties of PTFE-treated CCP, such as porosity, density, and contact angle, were almost similar to that of commercial carbon paper used as a GDL. Therefore, the CCP prepared from coconut coir can be applied as a GDL in a PEMFC.