

Designing a hydrophilic and conductive micro-porous layer for PEFC operation at low humidity condition

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We have developed a hydrophilic carbon black without any electrically conductive resistance in order to improve the performance of cell for polymer membrane fuel cells (PEFCs) at low humidity condition. Electrically conductive and hydrophilic carbon black has been applied to additional micro-porous layer (MPL) on the gas diffusion layer (GDL). 4,4'-Azobis(4-cyanopentanoic acid) was used for the introduction of carboxyl groups on the surface of carbon blacks. After that, the silane formed from 1,2-bis(triethoxysilyl)ethane was combined with hydrophilically modified carbon black to provide more hydrophilic surface modification without poor electronic conductivity between the carbon materials. The modified carbon blacks were deposited on hydrophobic MPL. As a result, this material improved the performance of cell due to lower ohmic resistance in polymer membrane at low humidity condition.