Hydrophobicity Patterning of Gas Diffusion Media and Performance in Polymer Electrolyte Fuel Cells

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Polymer Electrolyte Fuel Cells

Chemical energy → Electrical energy
lightweight – mobile – emission free

The water management dilemma
Gas diffusion layers:
- Ideally dry
- No blocked pores
- High gas diffusivity
- High cell performance
A balanced water management is critical for durability and performance. The GDL acts as passive transporter for charge carrier, gases and product water.

Laser ablation patterning

Patterned hydrophobicity by laser modification of PTFE-carbon composite in microporous layer (MPL) of GDL

Conclusions
- Ablative laser patterning of the MPL can improve cell performance.
- Ablative laser patterning of the MPL can improve the homogeneity of the current density
- less areas with extreme current density leads to longer life time.
- Patterned hydrophobicity improves the potential transport capability of the gas diffusion layers by adding local pathways.
- Combination of CCM (catalyst coated membrane) and GDL need to match – improvements in one component may not directly be transferred to other components!

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