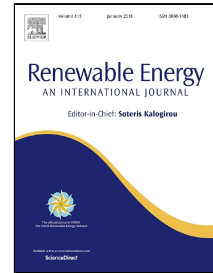


# Accepted Manuscript

Investigation of the effect of micro-porous layer on PEM fuel cell cold start operation

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- MPL reduces humidification requirement on each side for normal operation.
- Anode MPL improves cold start from  $-7^{\circ}\text{C}$  by improving membrane hydration.
- Cathode MPL hinders the ice formation on CL surface at  $-10^{\circ}\text{C}$ .
- Anode MPL reduces possibility of random ice blockage at very low temperature.
- Water shortage aggravates carbon corrosion and voltage reversal by fuel starvation.

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