

Non-Conventional Hybrid Microporous Layers for Enhanced Performance and Durability of PEM Fuel Cells

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Supplementary Materials

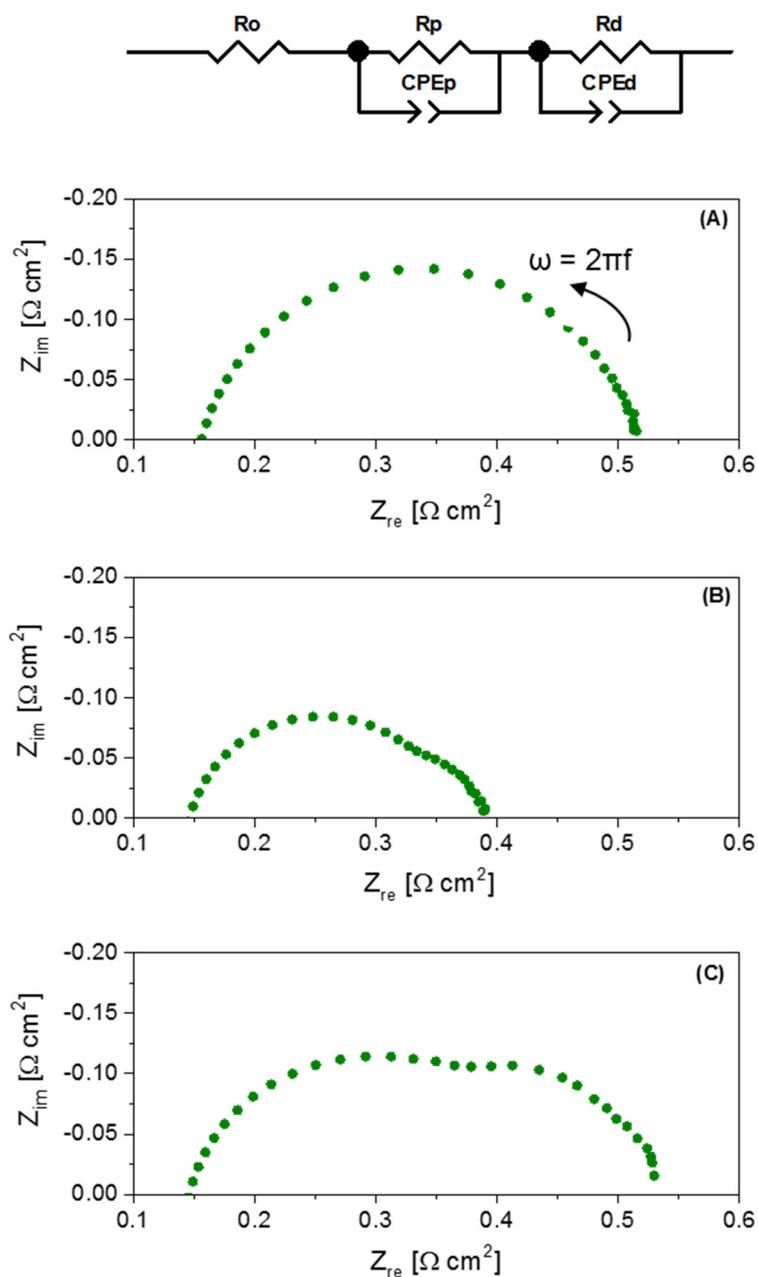


Figure S1. Equivalent circuit used for modeling impedance spectra and example of three spectra collected at (A) low (0.17 A/cm^2), (B) medium (0.43 A/cm^2) and (C) high current density (0.79 A/cm^2). Sample: CMC-0.25 DL, operating condition: $80 \text{ }^\circ\text{C}$ and RH (A-C) 80-60%.

R_o : ohmic resistance (high frequency intercept), R_p : polarization resistance modelling charge transfer at medium-high frequency, R_d : diffusive resistance modelling mass transport at low frequency.

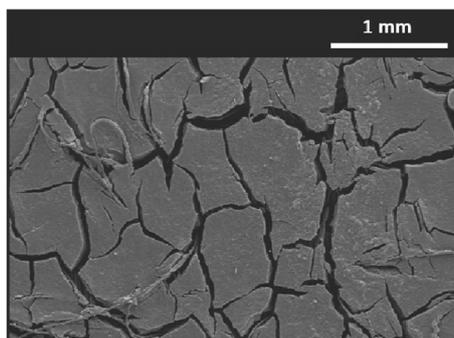


Figure S2. SEM picture of a single layer MPL without CMC, reprinted from International Journal of Hydrogen Energy, 40 (42), S. Latorrata, P. Gallo Stampino, C. Cristiani, G. Dotelli, Development of an optimal gas diffusion medium for polymer electrolyte membrane fuel cells and assessment of its degradation mechanisms, Copyright (2015), with permission from Elsevier

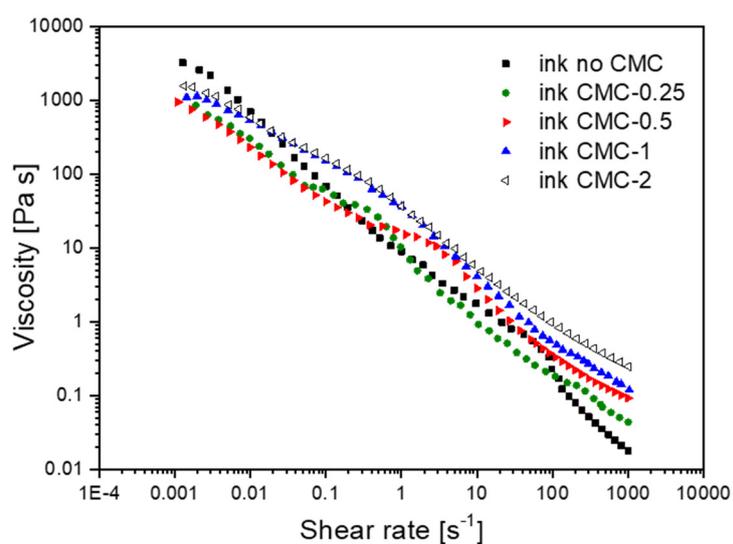


Figure S3. Rheological flow curves of the inks containing and non-containing CMC.

Thermogravimetric analysis (TGA) was performed on pure CMC powder with a DTA-TG SEIKO 6300 thermal analyzer. The experiments were carried out in flowing of air with a heating rate of 5 °C/min in the temperature range 25-1000 °C.

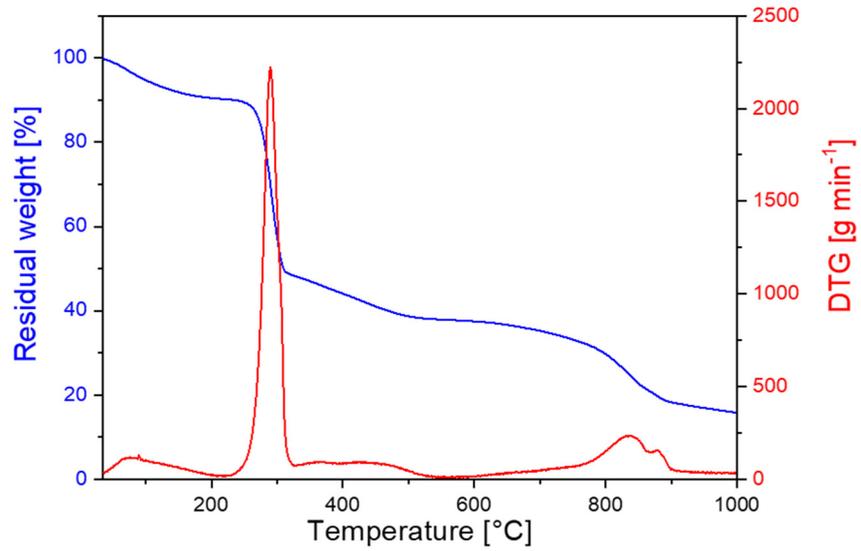


Figure S4. TGA of CMC.

This test evidences that residual CMC is likely present on the MPLs surface, which is supposed to be responsible for a progressive decrease of the static contact angle on increasing the CMC content.