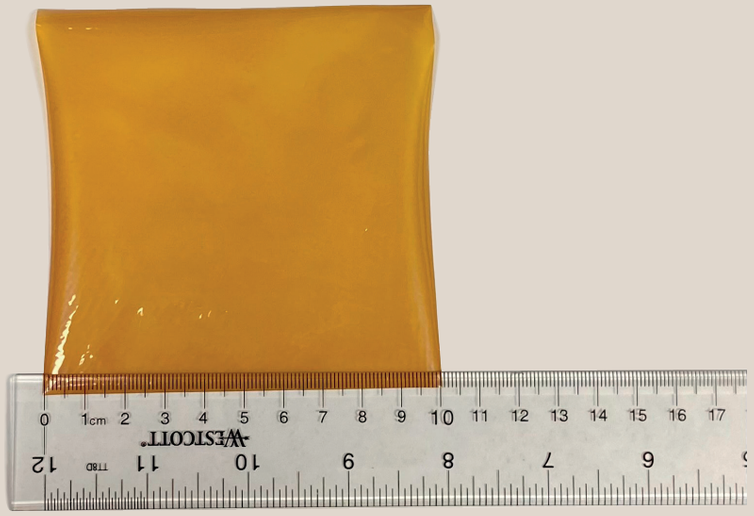
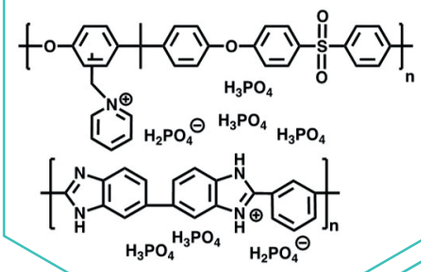
Ionomer Solutions

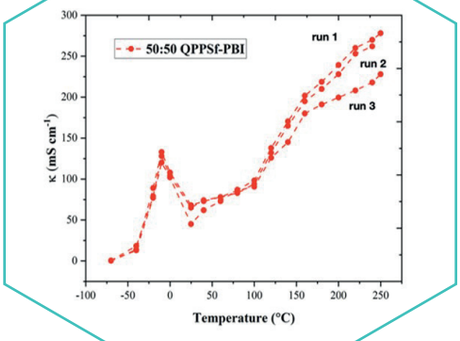
Leaders in high-temperature ionomers and porous ionic conductors

iPEM – high temperature polymer electrolyte membrane (HT-PEM)





Ionic conductivity data



iPEM is an ion-pair HT-PEM suitable for use in high-temperature electrochemical devices such as fuel cells and hydrogen pumps.

iPEM can operate across a wide-temperature range (-20°C to 250°C) without humidification and has excellent stability at 200 °C (*) in fuel cells and hydrogen pumps. It is also stable at 40% RH at 80 °C.

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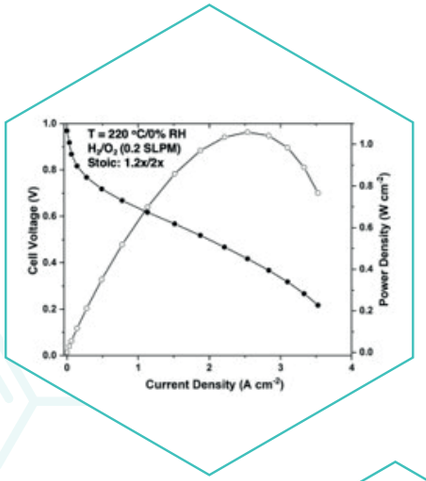
iPEM and pSOL performance in devices

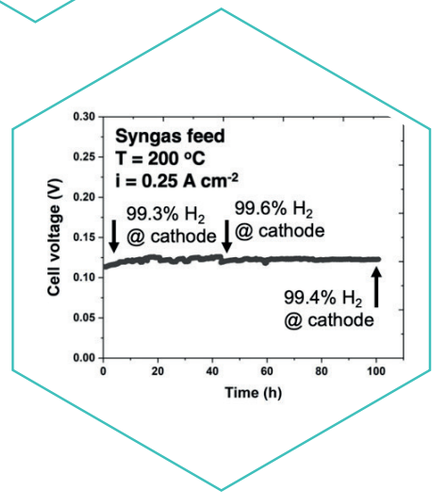
iPEM displays good fuel cell performance when paired with pSOL, an electrode phosphonic acid ionomer binder. Additionally, iPEM and pSOL were demonstrated in an electrochemical hydrogen pump for purifying hydrogen from gas mixtures with large CO content (40 mol% - i.e., syngas).

Membrane Properties

Membrane type	Proton exchange
Appearance/Color	Cloudy/orange
Thickness	60 µm ± 15 µm
Ionic conductivity without humidification	> 100 mS cm^{-1} at 150 °C



Fuel cell data: Gas diffusion electrodes with 0.4 mgPt cm^{-2} in the anode and 0.6 mgPt cm^{-2} in the cathode. 10 wt% pSOL binder in each electrode.



Electrochemical hydrogen pump data for purifying hydrogen from syngas (25% H_2 in 40% CO). Gas diffusion electrodes with 1 mgPt cm^{-2} and 30 wt% pSOL binder in each electrode.

* Based on longevity testing of 100 hours

- Venugopalan, G.; Arges, C. G. et al, ACS Applied Energy Materials 2020, 3 (1), 573.
- Chaichi, A.; Venugopalan, Arges, C. G. et al, ACS Applied Energy Materials 2020, 3 (6), 5693.
- Venugopalan, G.; Arges, C. G. et al, ACS Energy Letters 2022, 7 (4), 1322.
- U.S. Provisional Patent 62/832,916, International Patent PCT/US19/27118, European Patent EPO/ 19784427.7
- U.S. Utility Patent 17/046,611, International PCT 221205-2240, U.S. Provisional Patent 63/19,2607

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