

Supporting Information of:

**Operando Observation of CO₂ Transport Intermediates in Polyvinylamine Facilitated
Transport Membranes, and the Role of Water in the Formation of Intermediates, Using
Transmission FTIR Spectroscopy**

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The assembled permeation cell is shown from the front view (see **Figure S1(a)**) and the side view (see **Figure S1(b)**). The assembled cell is installed into the permeation system such that it rests on a holder in the FTIR spectrometer for operando measurements (see **Figure S1(c)**).

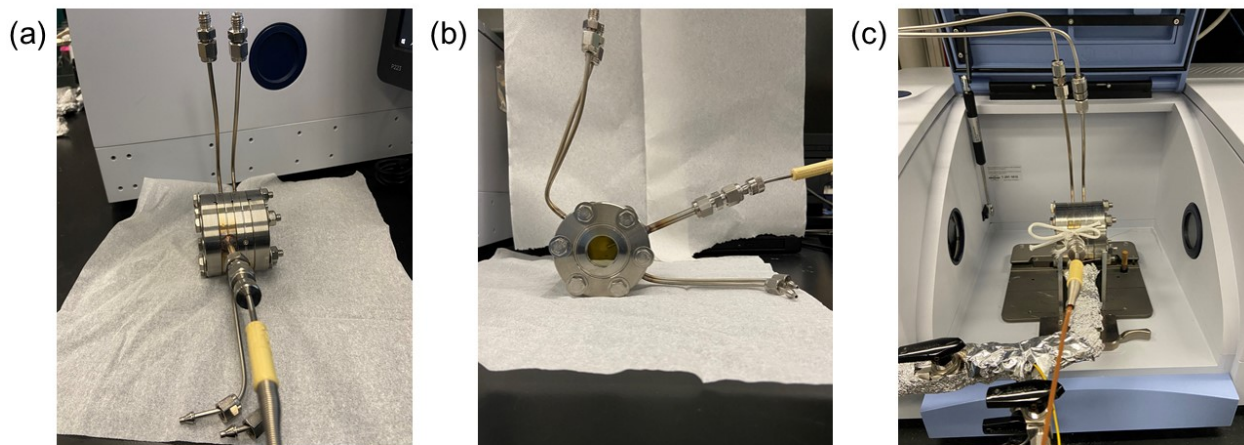


Figure S1. Assembled permeation cell from (a) front view and (b) side view and (c) assembled permeation cell installed to holder in spectrometer for operando measurements.

The FTIR spectrum of the thickest film ($59 \pm 1 \mu\text{m}$) displays saturated infrared bands from $1645\text{-}1690 \text{ cm}^{-1}$ and at 1590 cm^{-1} (see **Figure S2**). As expected, thinner free-standing films displays less saturation of these bands, with a $25 \pm 4 \mu\text{m}$ thick film displaying saturation from $1645\text{-}1690 \text{ cm}^{-1}$ and a $4 \pm 1 \mu\text{m}$ thick film displaying no saturation in the FTIR spectrum.

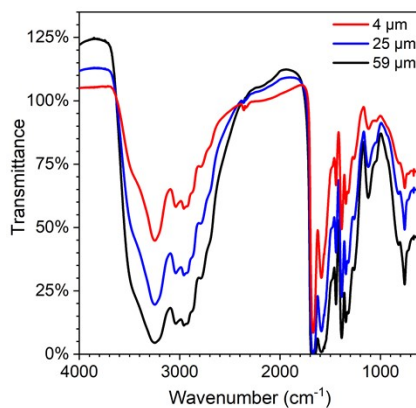


Figure S2. Transmission FTIR spectra collected of free standing PVAm films of varying thicknesses.

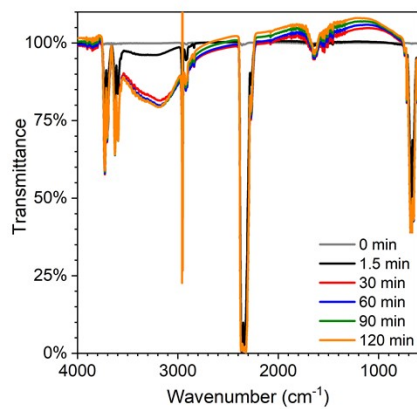


Figure S3. Transmission FTIR spectra for the porous PP support at 22 °C and humid 30 kPa CO₂, 3.7 kPa H₂O, and balance N₂.