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Quantitative monitoring of membrane permeation via in-situ ATR FT-IR spectroscopy[1] BRYAN BECKINGHAM, Lawrence Berkeley National Laboratory; Auburn University, DANIEL MILLER, Lawrence Berkeley National Laboratory — Ion conducting membranes are of interest for various energy applications including fuel cells and artificial photosynthesis systems. Within the context of artificial photosynthesis, membranes are desired that facilitate the ion transport necessary to feed the electrochemical reactions while meeting various additional selectivity and permeability demands depending on the CO2 reduction products. Herein, we demonstrate the use of in-situ ATR FT-IR spectroscopy to quantitatively resolve the concentration of single and multicomponent mixtures of various CO2 reduction products including methanol, formate and acetate. We then apply this methodology to the in-situ monitoring of the permeation of single and multicomponent mixtures across commercially available membranes. Membrane permeabilities and selectivities calculated from the single component time-resolved concentration curves are compared to the multicomponent permeation experiments.

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Bryan Beckingham
Lawrence Berkeley National Laboratory; Auburn University

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