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Ion Dynamics in Solid-State Polymer Electrolyte Electrochemical Cells using *in situ* Time-Resolved Infrared Spectroscopy FRANCIS RICHEY, YOSSEF ELABD, Drexel University —

Understanding ion transport in solid-state polymer electrochemical cells is of great interest for the advancement of cell efficacy. However, currently there is limited experimental knowledge of ion transport on a molecular level. In this study, we report a new spectroelectrochemical experimental technique that provides *in situ* molecular level detail about cation and anion transport of an ionic liquid in solid-state polymer electrolyte electrochemical cells. In situ time-resolved Fourier transform infrared attenuated total reflectance (FTIR-ATR) spectroscopy was utilized to measure the time dependent accumulation of ions at the cathode and anode interface under an applied potential. The results show that the cation and anion of the ionic liquid both transport and accumulate at the cathode under dry conditions, but only the cation accumulates at the cathode under humid conditions. This experiment was coupled with electrochemical impedance spectroscopy to simultaneously measure overall charge transport and cyclic voltammograms.

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