509a Room Temperature Ionic Liquid Membrane for Facilitated Transport of CO2

Ashutosh Jha and Paul Scovazzo

Room Temperature Ionic Liquids (RTILs) are organic salts that are liquids at ambient conditions consisting entirely of ions. RTILs possess a number of unique properties for making stabilized liquid membranes: negligible vapor pressure, high thermal stability, and non-flammability and high ionic conductivity. It is this last property, we exploit in our work to develop an active-facilitated transport membrane, which uses electricity as the driving force. RTIL high ionic conductivity, low vapor pressure, and high thermal stability make them an ideal working fluid in a membrane utilizing an electrochemical process. In our experiment, Electrochemically Modulated Complexation (EMC) transports CO2 through the ionic liquid membrane. EMC is a process that combines a reversible set of redox reactions with absorption/desorption steps to achieve selective separation of gas mixtures. In this paper, we will discuss RTIL system performance in reference to the critical parameters of an EMC system: CO2 solubility and CO2 carrier solubility. Using quinine as a CO2 carrier, we have been able to increase the partial pressure of CO2 from 0.005 atm to 0.85 atm across an initial Prototype liquid membrane. The second-generation membranes will transport CO2 not only against its chemical potential but also against a total gas pressure (i.e. a membrane Compressor)