334f Room Temperature Ionic Liquid/Polymer Composite Membranes for Chemical Separations

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Room Temperature Ionic Liquids (RTILs) are solvents consisting entirely of ions resembling the ionic melts of metallic salts; however, RTILs are liquids at much lower temperatures (298 K). RTILs have unique properties including high thermal stability, high ionic conductivity, negligible vapor pressure, and non-flammability. These properties make RTILs potential benign solvent replacements for volatile organics traditionally used in organic synthesis and separation processes. However, future process development using RTILs will require an ability to predict gas solubilities and diffusion coefficients in RTILs since many reactions and separations involve permanent or condensable gases. We have developed an experimental apparatus that can measure both the solubility and diffusion coefficient of various permanent gases and organic vapors in RTILs. Regular Solution Theory has been successfully used to analyze and predict the solubility behavior using immidizolium-based RTILs. The diffusion coefficient is independently determined by the use of a semi-infinite permeation analysis. We have successfully incorporated RTILs into polymer matrices and produced mechanically stable films. These matrices include amorphous polymers and ordered lyotropic liquid crystal phases. This approach holds the promise to obtain “tunable” properties for composite structures for a given separation.