

Influence of Different Gases and Metal Catalysts on Interfacial Tension and Viscosity of Ionic Liquids

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Ionic liquids (ILs) are interesting working fluids for various fields of chemical engineering. One of these fields is related to catalysis, where industrially relevant reactions like hydrogenation or hydroformylation can be realized using Supported Ionic Liquid Phase (SILP) systems. A new paradigm in SILP technology aims to perform catalysis preferentially at the gas-liquid interface by achieving a strong surface enrichment of the metal catalyst. To design and optimize SILP systems, knowledge of their thermophysical properties at process-relevant conditions is needed, yet often lacking. This applies especially to the bulk property viscosity and the interfacial tension (IT) as key parameters for the characterization of IL interfaces.

The present contribution discusses the influences of dissolved gases and metal catalysts on the IT and viscosity of ILs relevant to SILP systems. To characterize the gas-liquid interface at thermodynamic equilibrium, the pendant-drop method used

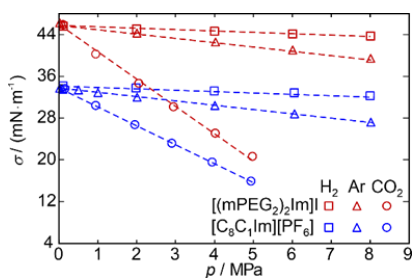


Figure 1: Influence of applied gas pressure on the IT of ILs at 303 K.^{1,2}

for the measurement of IT is combined with surface light scattering allowing access to viscosity and/or IT. The influence of representative gases dissolved in an IL at pressures up to 8 MPa is discussed for Ar or H₂ of low solubility and for CO₂ of high solubility (see Figure).^{1,2} In currently ongoing studies, the relationship between the IT of IL systems and the surface enrichment of dissolved Pt or Rh complexes is scrutinized.

[1] Z. Zhai and Thomas M. Koller, *J. Mol. Liq.*, 2023, **377**, 121491, DOI:10.1016/j.molliq.2023.121491.

[2] Z. Zhai *et al.*, *Int. J. Hydrog. Energy*, 2024, **72**, 1091-1104, DOI:10.1016/j.ijhydene.2024.05.249.

[3] S. K. Antara *et al.*, *ChemCatChem*, 2024, DOI:10.1002/cctc.202400574.