289t Kinetics and Phase Equilibria in Biphasic Ionic Liquid/Co_2 Systems

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Separating and recycling organometallic catalysts remains a key concern for industrial homogeneously-catalyzed reactions. Recently, a new biphasic approach has been proposed based upon ionic liquids (ILs) and compressed or supercritical CO_2. Ionic liquids are organic salts, which are liquid near ambient conditions and possess little to no volatility. They sequester the catalyst for recycle or continuous use. ILs are immeasurably insoluble in compressed or supercritical CO_2 while CO_2 is very soluble in the IL phase. A few studies from the literature indicate that CO_2 may enhance reactivity and selectivity in catalyzed reactions in ILs. The high CO_2 solubility of in the IL phase is believed to increase interphase mass transfer and/or increase the solubility of the reactant gases in the catalytic IL phase. However, little quantitative data exists on the kinetics, and phase equilibria of these systems. This investigation will illustrate the effect of CO_2 on the Rh-catalyzed hydrogenation and hydroformylation of olefins in a biphasic ionic liquid/CO_2 system. The kinetic results will be discussed in terms of phase equilibria.