Carbon Dioxide Capture using Ionic Liquid 1-butyl-3-methylimidazolium acetate

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Carbon dioxide capture using aqueous amine scrubbing is currently considered the most feasible option for separating CO_2 from post-combustion flue gas. Using simple absorption and stripping configurations, monoethanolamine has been commercially demonstrated to effectively scrub CO_2 from post-combustion flue gas. However, the current capital and operating costs are high and do not meet the Department of Energy's target to remove 90% of the CO_2 from post-combustion flue gas with no more than a 35% increase in the cost of electricity. The evaluation of advanced absorbents, adsorbents and membranes is under way in order to find the most energy-efficient CO_2 capture technology. We have modeled an ionic liquid that can reduce the energy losses by 16% compared with a commercial monoethanolamine process. The choice of the ionic liquid, 1-butyl-3-methylimidazolium acetate, has not been optimized but was chosen based on chemical absorption behavior and the desire to understand performance. Engineering design estimates indicate that the investment for the ionic liquid process will be 11% lower than the amine-based process and provide a 12% reduction in equipment footprint. A parametric study examined four improvements in the ionic liquid technology which may reduce even further the energy and cost required for CO_2 capture.[1]

[1] M.B. Shiflett, D.W. Drew, R.A. Cantini, A. Yokozeki, *Energy Fuels*, *24*, **2010**, 5781-5789.