Supporting Information

Low Temperature Carbon Capture using Aqueous Ammonia and Organic Solvents

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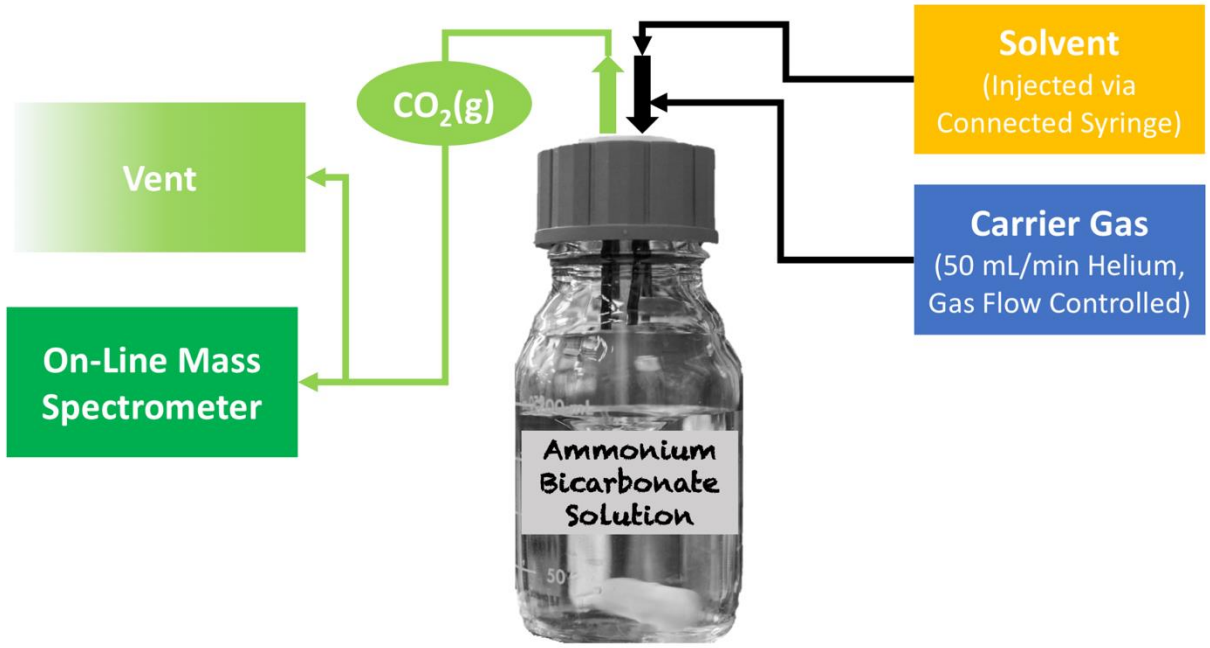

Figure S1: A schematic diagram of the bench scale on-line mass spectroscopy closed setup for continuous reading of gas stream components and their relative partial pressures. Helium flowed (gas flow controller regulated 50 mL/min) into a 250 mL glass bottle containing 100 mL of aqueous ammonium bicarbonate solution at atmospheric pressure. The container was purged for 30 minutes before organic solvent injection. Organic solvent was injected via a 30 mL glass syringe and the solution was stirred via a magnetic stir bar under room temperature pressure (RTP) conditions at a consistent angular velocity for all trials. Apparatuses were connected to a three port, GL-45 Cap (Kinesis Inc.) via low density polyethylene (LDPE) tubing.

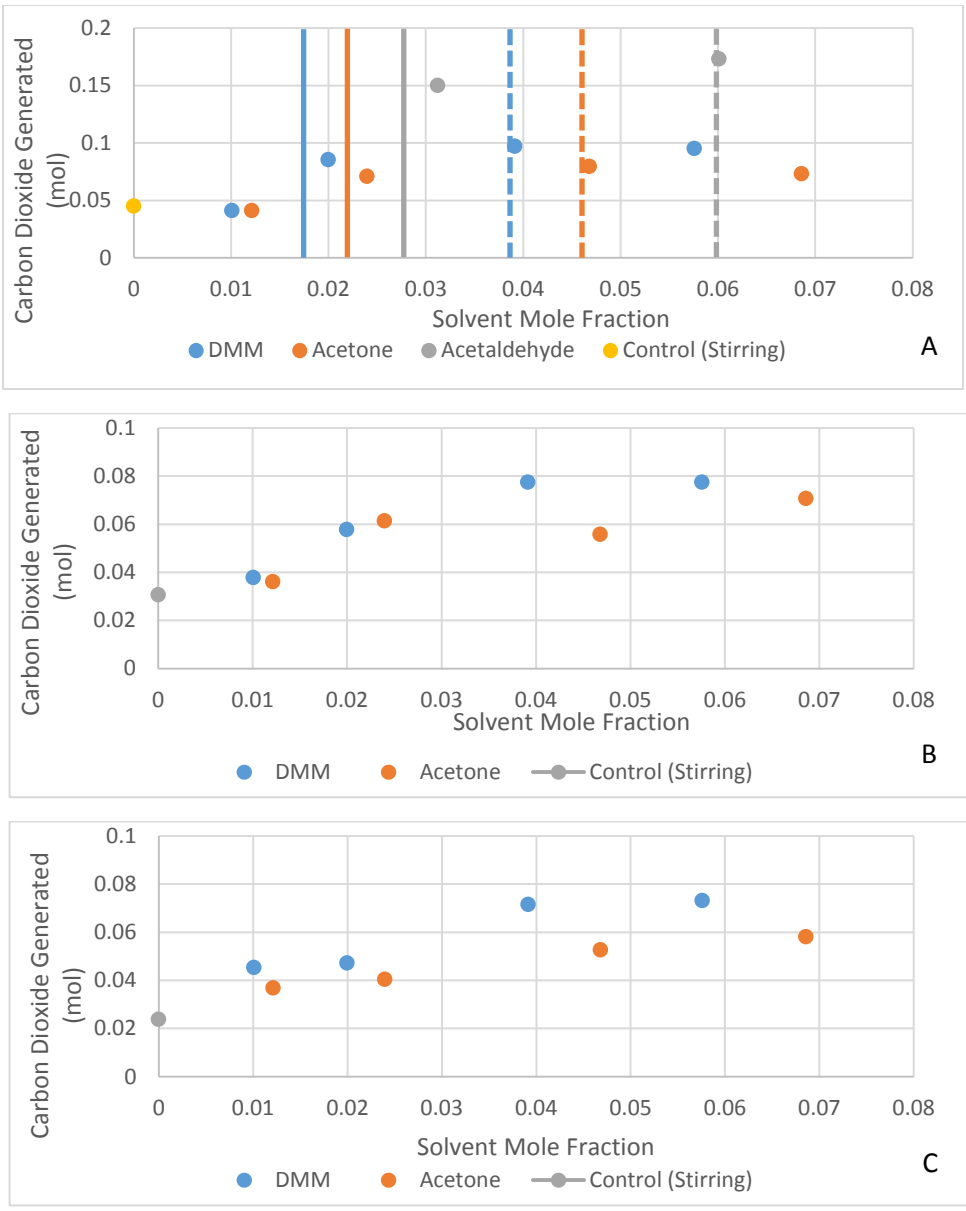

Figure S2: CO_2 release (moles) as a function of final solvent mole fraction and solvent type for: A) 2 M ammonium bicarbonate, B) 1.5 M ammonium bicarbonate, and C) 1 M ammonium bicarbonate. In (A), solid lines indicate the maximum mole fraction of solvent before eliciting CO_2 gas release (x_b = 0.0216 for acetone, 0.0181 for dimethoxymethane, and 0.0279 for acetaldehyde). Dashed lines in (A) indicate the optimal organic solvent mole fraction (x_f = 0.0467 for acetone, 0.0393 for dimethoxymethane, and 0.0599 for acetaldehyde:). Experiments were conducted using the on-line mass-spectroscopy setup (Figure S1) with solvent injected into an ammonium bicarbonate solution with stirring at a consistent stir rate.

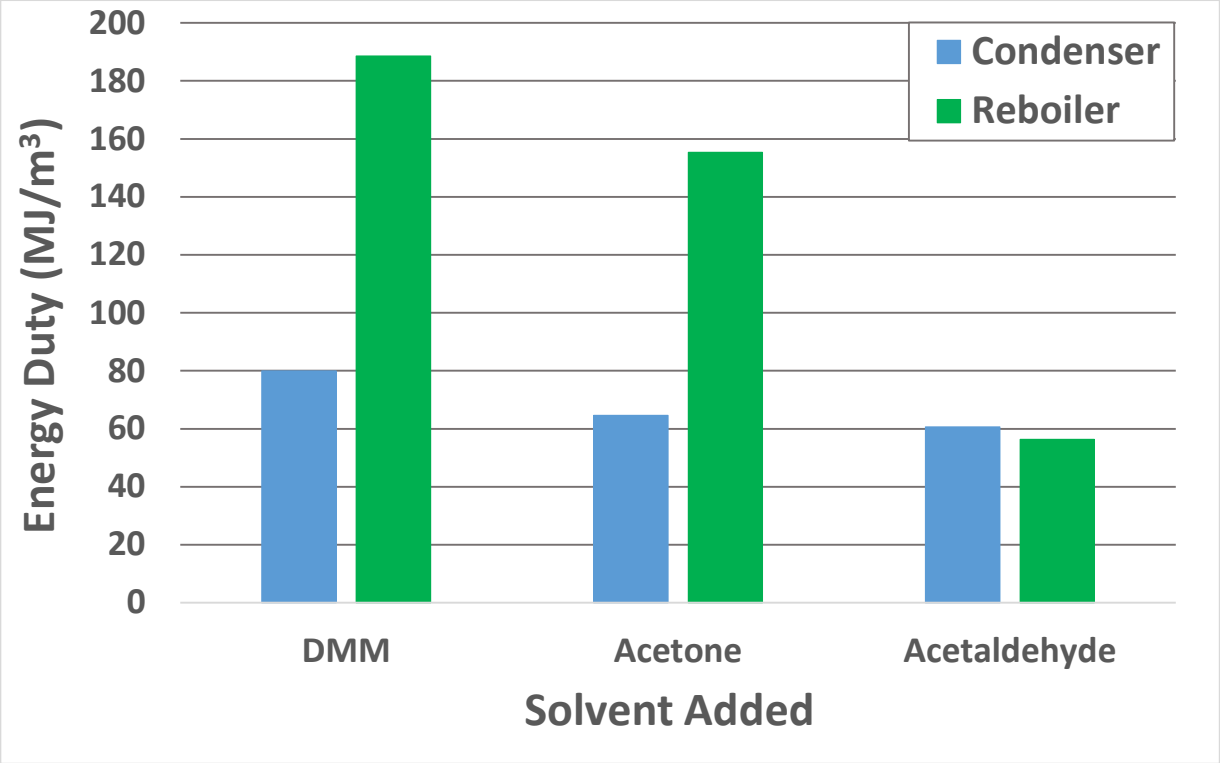

Figure S3: Distillation column reboiler and condenser energy loads per cubic meter of total solution following the addition of each organic solvent. In the simulated distillation column, the feed solution contained the optimal organic solvent mole fraction for CO_2 generation (x_f) and the bottom solution contained the maximum mole fraction of solvent before eliciting CO_2 gas release (x_b). Both x_f and x_f are shown in Figure S2.