Supplementary Materials

Batch-cell-absorption experiments

Equipment

A simplified diagram of the system used to determine the absorption behavior of the absorbents is shown in Figure S1. A 316 stainless steel cell was constructed with a 6-point flange and a neoprene seal. A Dwyer Instruments Inc. (Michigan City, In., USA) digital pressure gauge was used to measure gas pressure changes whose operating range is up to 200 psi with accuracy of ± 1 psi. A Lauda E100 (Champaign, Il., USA) bath temperature controller with accuracy of ± 0.1 ° C helped set the desired temperature. Stirring was applied by means of a Heidolph (Schwabach, Germany) magnetic stirring plate. For the evacuation of gases from the cell, a vacuum pump Varian DS 102 (Torino, Italy) was used coupled to a cold trap system with a Thermo Scientific Neslab Digital Plus (Waltham, MA., USA) steam condensation bath with antifreeze that works at -15 ° C (omitted in Figure S1 for simplicity purposes).

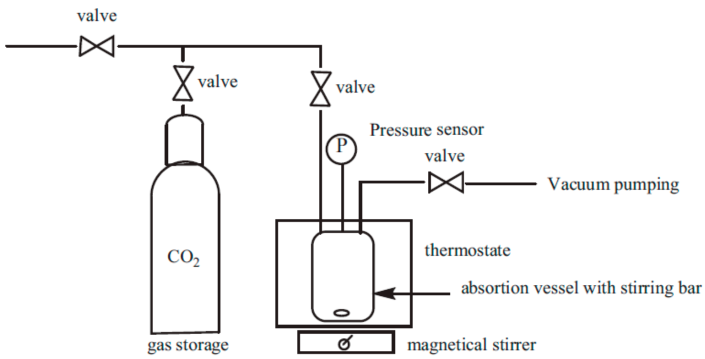

Figure S1. Batch-cell equipment for absorption experiments.

Methodology

The first stage for determining the CO_2 absorption capacity by means of a liquid consists in measuring the weight of the liquid to be evaluated. Then, it is placed inside the cell and closed by adjusting the screws diagonally. As the next stage, the cell is placed inside the controlled temperature bath and 30 min are waited for reaching the working temperature. While achieving this temperature, the evacuation of the atmospheric air can be carried out using vacuum for at least 30 min at a pressure ranging from 22 to 25 Hg inches. The CO_2 feeding is then carried out at the desired working pressure. Subsequently, stirring is started and pressure changes are recorded on the digital manometer until there is no variation (± 0.1 psi) for 1 h. After this time, the experiment is stopped and the gas absorption by the liquid is completed.

During the absorbent regeneration stage, a modified arrangement of the apparatus displayed in Figure S1, at atmospheric pressure with cooling system, was employed. The spent liquid (saturated with CO_2) is placed in a flask equipped with refrigerant, which is in a controlled temperature bath for 30 min and constant stirring. Three regeneration cycles were performed at 80, 90, 100 and 120 ° C. The results for the [TBP][Lys] aqueous system at 10 wt. % are shown in Figure S2.

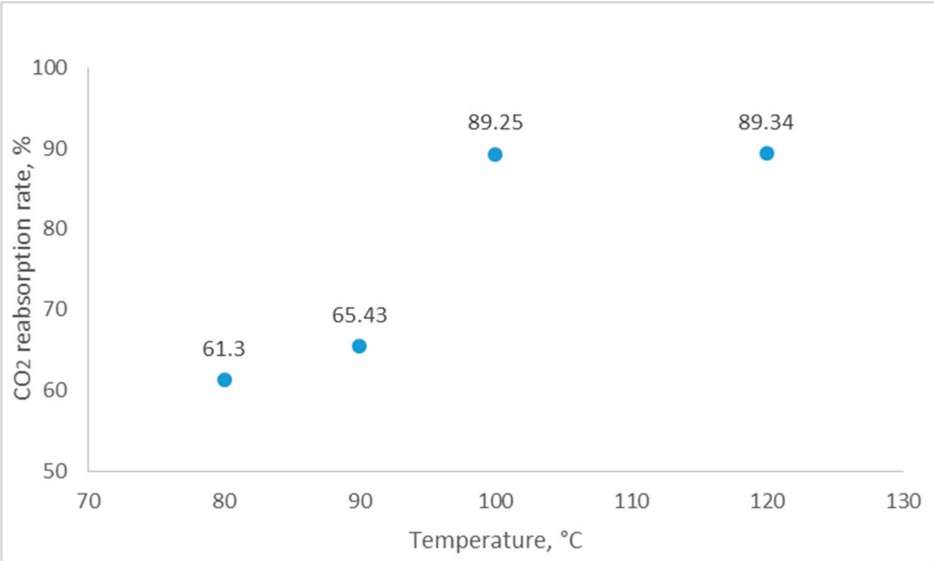

Figure S2. CO_2 reabsorption rate as a temperature function using [TBP][Lys] at 10 wt.%. The data shown is the average of three regeneration cycles.

As it can be seen in Figure S2, the most suitable temperature for regenerating the absorbent is 100 ° C; at this temperature, the maximum CO_2 reabsorption is reached in 3 cycles.