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Effect of pH and Temperature on CO_2 Capture and Brine Salinity during CO2 Reaction with Reject Brine

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The CO2 capture efficiency and brine salinity reduction at different pH values and temperature ranges for the traditional and the modified Solvay processes have been studied using a novel gas-liquid contactor system. The use of different concentrations of ammonium hydroxide and calcium oxide allows investigating the reaction efficiency up to pH = 11.2 and 12.1, respectively. The buffering capacity of calcium oxide was found to exceed the buffering capacity of ammonium hydroxide at the same buffer (NH4OH/CaO) concentration and temperature. The maximum reaction efficiency can be related to the effect of buffering reagents by shifting the reaction towards bicarbonate formation.

In addition, controllable water circulation through the jacket of the gas-liquid contactor system was performed in order to demonstrate the effect of temperature on CO2 capture and brine salinity reduction. The results showed the CO2 solubility in the brine and hence the reaction with dissolved salts to form salt bicarbonate increased when decreasing the temperature. At the same time, reduction in the temperature reduces the solubility of sodium bicarbonate and consequently enhances salinity reduction.

Biography

Ameera Mohammad has been working on CO2 capture and reduction of water salinity as a research assistant at UAE University since 2011. This was part of her Master thesis and now continuing in the same area for her PhD. She has published numerous journal papers and made many conference presentations in this area.

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