Abstract

Carbon dioxide (CO_2) captures by absorption based solvent is one of the most commercially utilized technologies. CO_2 captures is studied experimentally in bubble column operating in different velocity.

A laboratory unit was constructed for this purpose where stainless steel bubble column of 5 cm i.d × 33 cm height in which experiments in which the performance of CO_2 captures into 30 wt% potassium carbonate from gaseous mixture experiments could be carried out under different operating condition namely, Superficial gas velocities ; promoter types (Potassium Alaninate), (Potassium Argininate), (Potassium Prolinate), (Potassium Serinate) and concentrations, and absorbent temperature.

The results obtained that CO_2 absorption into promoted and un-promoted potassium carbonate showed that the dissolved gas undergoes a pseudo-first order reaction. For the reaction regime, the results show that Hatta number larger than 2, this indicated that the reaction is fast and the mass transfer rate sole determining factor. Higher absorption rate and CO_2 loading were obtained at low gas velocity (homogeneous flow regime), While they decreased with the increasing absorbent temperature.

The addition of amino acid salts promoter results in a significant increasing performance of CO_2 absorption. Maximum carbonate conversion (96.57%) between CO_2 and 30% K_2CO_3 obtained for potassium serinate (at 0.07 m/s , 0.05M, 19^0C) and potassium prolinate (at 0.03 m/s , 0.05M, 22^0C) as a promoter. Where maximum un-promoted carbonate conversion obtained (78.57%) at 30^0C and 0.07 m/s.

Potassium prolinate and potassium alaninate give higher CO_2 Loading absorption rate and potassium carbonate conversion compared with potassium argininate and potassium serinate at ٠.٠3 m/s, 50 ^{0}C. Increasing promoter concentration for (0.1, 0.5M) potassium prolinate and potassium alaninate have not or little effect.