

Analysis of CO₂ removal mechanism between the CO₂ and NH₃ reaction in an aqueous solution

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Although aqueous ammonia solution has been focused on the removal of CO₂ from flue gas, there have been very few reports regarding the underlying analysis of the reaction between CO₂ and NH₃. In this report, aqua ammonia process was operated at various temperatures i.e. 40°C, 20°C, and 5°C. The CO₂ removal efficiencies and the loss of ammonia were influenced by the operating temperatures. Also, infrared spectra and pH measurement were used for the understanding of formation mechanism of ion species in absorbent, such as NH₂COO⁻, HCO₃⁻, CO₃²⁻, and NH₄⁺, during CO₂ and NH₃ reaction. The reaction CO₂-NH₃ at 20°C and 40°C has the similar reaction routes. However, the different reaction route was observed at 5°C compared to the other operating temperatures, displaying reaction product of ammonium bicarbonate solid was observed relatively after reaction time of 120 min. The CO₂ removal efficiencies and the formation of carbamate and bicarbonate were strongly influenced by the operating temperatures. In particular, the analysis of the formation carbamate and bicarbonate by infrared spectra and pH measurement provides useful information on the reaction mechanism of CO₂ and NH₃ in aqueous solutions.