

Analysis on the Reaction between CO₂ and NH₃ in Aqueous System for CO₂ Capture

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We analyzed the reaction between CO₂ and NH₃ in aqueous system by calculation and experiment. The quantitative profile of six species could be obtained by calculation, while the experimental methods used to investigate the reaction qualitatively were ¹³C Solid State NMR and FT-IR at the initial concentration range of 5 to 25 wt% NH₃ under the condition of 25°C and 1 atm. As its loading of CO₂ increased above 0.5 in the process of reacting to CO₂, the content of bicarbonate increased relatively by means of the formation reaction of or conversion into bicarbonate, demonstrating that solid precipitates were produced by ammonium bicarbonate due to the limitation of solubility. Depending on the concentration of NH₃ and reaction time under the same experimental condition, pH of reaction products could be determined. When three species of products, which were ammonium carbamate, ammonium carbonate, and ammonium bicarbonate, approached to pHs which make themselves exist stably, the formation reaction of them occurs favorably. The qualitative behavior of reaction derived by FT-IR and pH measurement confirms the validity of simulation by comparing to the profiles of bicarbonate and carbamate by calculation.