

Ammonium salt/ion speciation in a ammonia-based carbon dioxide capture process

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Ammonia has received special attention as an effective absorbent in CO₂ capture process because of its higher CO₂ absorption capacity and lower chemical cost. In an ammonia-based CO₂ capture process, which usually consists of absorption and regeneration steps, the speciation of salt/ions in the aqueous phase greatly affects the overall process efficiency, especially the energy requirement for NH₃ regeneration. In this study, we examined the salt/ions contained in ammonia solution using a ¹³C NMR spectrometry and identified that bicarbonate (HCO₃⁻), carbonate (CO₃²⁻) and carbamate (NH₂COO⁻) were present in the aqueous phase. During the absorption reaction, NH₂COO⁻ was prevailing at the initial stage however at the end of reaction the HCO₃⁻ was dominant. In the regeneration step, the NH₂COO⁻ is present always higher than CO₃²⁻ and HCO₃⁻ was significantly decreased. Consequently, the ¹³C NMR analysis can be help to understand the reaction of ammonia and CO₂ and optimize the CO₂ capture process.