Invited Lecture IL 09

Physical Chemistry of Amine-Based Carbon Dioxide Separation

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Key Word (3 words)

CO_2, Reaction mechanism, Solvation

Abstract (less than 300 words)

CO_2 capture and storage (CCS) technology is an effective CO_2 fixation technology. Today, this technology has become important due to the threat of global warming and climate change. Furthermore, the development of CO_2 capture and utilization (CCU) technology, which reuses the captured CO_2, has been prioritized in recent years. In this context, CO_2 separation is one of the key processes on a pathway to net zero emissions. Regardless of the maturity of various types of CO_2 separation technologies, amines are the most used chemical species in a variety of separation methods. This is because the moderate interaction between amines and CO_2 allows effective "catch and release [1, 2]." We have been studying physical and chemical properties of amines and amine-containing media for CO_2 separation. The physical properties including the boiling point, diffusion coefficient, and polarity are of vital information for understanding, designing, and optimizing amine-based CO_2-separation technologies [2, 3]. In those technologies, the central chemical reactions are carbamate formations and bicarbonate formations [4, 5]. The branding ratio of these reactions, which depends on the structure of amine molecule, greatly affects the CO_2-separation performance [6, 7]. The complicated molecular interactions, various elementary steps, by-products, and surrounding envelopments are involved in these reactions. Among them, the effects of substituents such as alkyl and hydroxy groups, hydrogen bond, and solvation are of paramount importance [8, 9].

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