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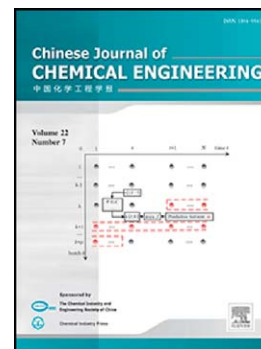
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Separation Science and Engineering

Carbon Dioxide Induced Degradation of Diethanolamine during Absorption and Desorption Processes

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Abstract

Alkanolamines are widely used in the purification of the sour gas sweetening process. During the sour gas absorption process, CO₂ significantly degrades the amine solvent and creates enormous problems for plant operation. In this work, CO₂ induced degradation of aqueous diethanolamine (DEA) solution was conducted in a 1.25L jacketed glass reactor that functioned as an absorber and stripper at atmospheric conditions. Pure CO₂ was bubbled through the reactor until the solution became saturated. In this study, the concentrations of DEA used were in the range of concentrations between 2 mol·L⁻¹ to 4 mol·L⁻¹. In the degradation experiment, six generic cycles were conducted for each run. Each cycle was configured with the absorption and desorption of carbon dioxide at 55 °C and 100 °C, respectively. Samples were collected after a predetermined experimental time and analyzed by ion chromatography (IC) to identify unknown ionic degradation products (DGPs). In the IC analysis, three different columns were used for anion, cation and ion exclusion systems, which are Metrosep A Supp 5 150/4.0, Metrosep C Supp 4 150/4.0 and Metrosep Organic Acids, respectively. The major identified DGPs of D01DEA2M, D02DEA3M, and D03DEA4M are nitrite, acetate and ammonium. Phosphate product was found in the degraded amine samples which might be due to the contamination of water or chromatographic system.

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