

S3.5.3 MODEL STUDY HEAT OF ABSORPTION FOR CO₂ CAPTURE BY CHILLED AMMONIA

Qiang Zhou, Eric Croiset, Zhongchao Tan
University of Waterloo

A thermodynamic model was developed for the calculation of heat of absorption for CO₂ capture using chilled ammonia process (CAP). The model was based on e-NRTL activity coefficient model solved with Aspen plus software. The model was firstly validated by experimental data obtained at different temperatures (40 and 60 oC), and then it was applied to low temperatures (2-40 oC) with different CO₂ loadings. The overall heats of absorption of the system and individual reactions taking were predicted. The results showed that there was no solid formation at the low CO₂ loading even at low temperatures (0-20 oC). However, solids were formed with increasing CO₂ loading at these temperatures, and overall heat of CO₂ absorption increased with increasing solid concentration in the solution. Furthermore, the overall heat of absorption did not change much with the temperature at low CO₂ loading (i.e. less than 0.5 mol CO₂/mol NH₃). With a high CO₂ loading, low temperature showed a negative effect on the overall heat of absorption.