

Investigating the Equilibrium Solubility of Carbon Dioxide in the Mixture of Triethanolamine, Piperazine and Water by Using CPA Equation of State

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Abstract

In this study, the CO₂ gas absorption process has been investigated modeling in order to find suitable adsorbent, as well as determination of the solubility and mass transfer mechanism. To calculate the solubility of CO₂ in a solution of triethanolamine and piperazine, the CPA state equation will be used to predict the properties of the system. The results show that with increasing pressure, the absorption of CO₂ in the gas phase increases due to the increase of the CO₂ absorption of density gradient. By increasing the temperature, the amount of CO₂ absorbed in the adsorbent solution decreases, due to the calorific of the CO₂ absorption by the use of an amine absorbent solution. Also, by increasing the concentration of piperazine in the amine absorbent solution, the amount of CO₂ absorption increases as a result of increasing the reaction rate of the amine solution with CO₂ in the presence of piperazine. The highest overall error rate obtained from the reported data for operating pressure, temperature and piperazine concentrations variable is 7.3%, 7.4% and 4%, which is considered an acceptable error rate, respectively.

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