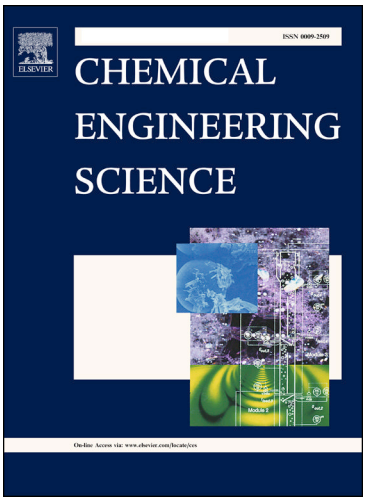

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An experimental and modeling study of CO_2 solubility in a 2-amino-2-methyl-1-propanol (AMP) + N-methyl-2-pyrrolidone (NMP) solution

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Abstract

In this study, an experimental setup based on the static-synthetic method was used to measure the new experimental data of CO_2 solubility in an aqueous solution of 2-amino-2-methyl-1-propanol (AMP) + N-methyl-2-pyrrolidone (NMP) solution. For the static-synthetic method, the mass balance of compositions and the pressure–volume–temperature conditions were used for measuring the amount of absorbed CO_2 by the AMP+NMP solution. The measurements were performed over a temperature range of 313.15 to 353.15 K, CO_2 partial pressure up to 316.7 kPa, and in different concentrations of the AMP+NMP solution. Two models, modified Kent–Eisenberg, and Deshmukh–Mather, based on the empirical correlations and activity-fugacity approach, respectively, were used for the prediction of experimental data. The parameters of the equilibrium constants of the protonation and carbamate reactions for the modified Kent–Eisenberg model and the interaction parameters for Deshmukh–Mather model were obtained. For validation of our setup, a new set of experimental data for the solubility of CO_2 in an aqueous solution of AMP, methyldiethanolamine (MDEA) and diethanolamine (DEA) were measured and compared with existing experimental data in the literature, and good results were obtained. The results of the modeling study showed that the Deshmukh–Mather model gave a better prediction of experimental CO_2 loadings data than the modified Kent–Eisenberg. Also, the results showed that the solubility of CO_2 in an aqueous solution of AMP+NMP increases as the CO_2 partial pressure increases while the temperature decreases.

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