Experimental and Modeling study of the CO_2 absorption performance into DEEA solution in membrane contactor

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Abstract

In this study, the absorption process of the aqueous DEEA solution for CO2 capture in polytetrafluoroethylene hollow-fiber membrane contactor was investigated by both experiment and simulation. Based on the finite element analysis method, a two-dimensional steady-state mathematical model was established using COMSOL Multiphysics simulation software to calculate the CO2 mass transfer flux (JCO2) of DEEA in the hollow fiber membrane contactor under non-wetting and partial wetting conditions and the distribution of CO2 concentration under corresponding conditions. The results show that the predicted JCO2 under 15% membrane wetting conditions is in good agreement with the experimental value, and the mass transfer performance is severely reduced under wetting conditions. In addition, a dimensionless equation was developed to predict the liquid phase, gas phase and membrane phase mass transfer coefficient and JCO2. The calculated JCO2 values are in good agreement with the experimental values with the average relative deviation (AARD) of 9.4%.

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