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## STATISTICAL ANALYSIS OF OPERATING PARAMETERS IN A FALLING FILM REACTOR FOR CO<sub>2</sub> ABSORPTION USING DIETHANOLAMINE

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### Abstract

Absorption of carbon dioxide (CO<sub>2</sub>) from flue gases is very important to various industries and chemical absorption by diethanolamine (DEA) can be used for this purpose. This work dealt with the effect of operating parameters on the CO<sub>2</sub> output concentration and the absorption rate of CO<sub>2</sub> in aqueous DEA solution. CO<sub>2</sub> was absorbed in a falling film reactor at standard pressure and temperature. The reactor length and diameter were 1m and 0.0254m, respectively. The values of the CO<sub>2</sub> output concentration vary between 23 to 7393 ppm and the absorption rate of CO<sub>2</sub> in aqueous DEA varies between 2.68E-08 to 2.40E-07 kg/s. The results showed that the absorption rate of CO<sub>2</sub> in the aqueous DEA solution increased with an increase in gas flowrate, the CO<sub>2</sub> concentration in gaseous mixture and DEA percent. In addition, the results were statistically examined by Design-Expert software, using response surface experiment design and a historical method. Two mathematical relations were proposed to estimate the output concentration of CO<sub>2</sub> and the absorption rate of CO<sub>2</sub> in the aqueous DEA solution with good accuracy for falling film reactor ( $Re_G \in [1; 6]$  and  $Re_L \in [4; 40]$  at 298 K).

*Key words:* DEA, Design Expert, experimental relation, falling film

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