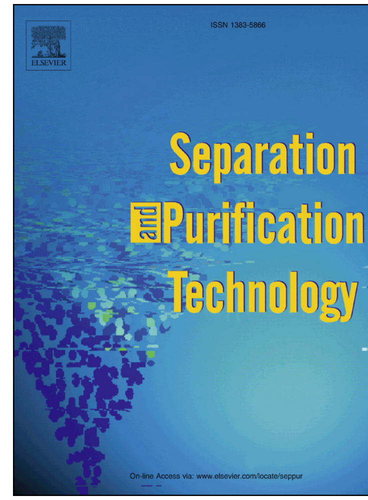

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W.H. Tay, K.K. Lau, A.M. Shariff

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High frequency ultrasonic-assisted chemical absorption of CO_2 using monoethanolamine (MEA)

W. H. Tay, K. K. Lau*, A. M. Shariff
Research Centre for CO_2 Capture, Department of Chemical Engineering, Universiti Teknologi PETRONAS, 32610 Bandar Seri Iskandar, Perak Malaysia

*Corresponding author. Tel.: +605-3687589; fax:+605-3656176.
Email address: laukokkeong@petronas.com.my

Abstract

The paper aimed to study the chemical absorption of CO_2 in monoethanolamine solvent (MEA) using high frequency ultrasonic irradiation of 1.7 MHz. The experiment was conducted at instantaneous regime in order to study the physical enhancement effect of the ultrasound. Hence, a mathematical model is proposed to justify the enhancement effects involved in the absorption process. The parameters of the experiment included ultrasonic power, MEA concentration, temperature, and CO_2 partial pressure. Results show that, a significant increase in the chemical absorption rate can be obtained by using ultrasonic power of 18 W, which is up to 60 times faster than the case without ultrasonic irradiation. Besides, the experimental data is in good agreement with the simulated data by obtaining the R^2 values ranged from 0.989 to 0.997. Therefore, this study demonstrates a new technology to improve the absorption process. Besides, the enhancement for the chemical absorption using ultrasonic irradiation is believed to be dominated by the fountain formation and also the convective dynamic. In overall, ultrasonic-assisted absorption would be one of the potential alternatives for CO_2 capture with its advantages of high mass transfer coefficient and compact design.