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Supplementary material

Modeling and Experimental Studies on Carbon Dioxide Absorption with Sodium Hydroxide Solution in a Rotating Zigzag Bed

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It can be calculated from k_L and k_G in Table S1 that the contribution of the gas-side mass transfer resistance to the total mass transfer resistance cannot be ignored. However, the main mass transfer resistance still lies on the liquid side. Compared with the k_G in Reference [10], the k_G in our study was smaller because the inlet gas flow rate was two orders of magnitude smaller than that in Reference [10].

The difference in the value of k_L and a between this study and Reference [10] resulted from different experimental conditions. As for k_L, the value in this study was higher than that in Reference [10] because NaOH concentration and temperature of NaOH solution used in this study were higher than those in Reference [10]. In terms of a, the value in this study was close to that in Reference [10] due to a similar structure.

It can be seen from Table S2 that the liquid-side mass-transfer coefficient and gas-liquid effective interfacial area in zone Ⅱ were larger than those in zone Ⅰ and Ⅲ, and thus liquid-side volumetric mass-transfer coefficient in zone Ⅱ was much higher than that in zone Ⅰ and Ⅲ, suggesting that the main contribution of liquid-side mass transfer was from zone Ⅱ. The above conclusions in this study agree with those in Wang et al.'s research [2].

Citation: Liu, Z.; Esmaeili, A.; Zhang, H.; Wang, D.; Lu, Y.; Shao, L. Modeling and Experimental Studies on Carbon Dioxide Absorption with Sodium Hydroxide Solution in a Rotating Zigzag Bed. *Processes* **2022**, *10*, 614. https://doi.org/10.3390/pr10030614

Academic Editors: Elio Santacesaria, Riccardo Tesser and Vincenzo Russo

Received: 21 February 2022
Accepted: 17 March 2022
Published: 21 March 2022

Table S1. Comparison of mass transfer performance between RZB in this work and that in Reference [10].

	This work	**Reference [10]**
Rotor volume (cm^3)	665	2821
G (m^3/h)	0.2-1.2	10-40
L (L/h)	25-40	80-240
N (rpm)	400-1200	600-1400
T (K)	293.15-313.15	293.15-298.15
C (kmol/m^3)	0.1-0.2	0.05 or 1 (NaOH), 0.87 (ethanol)
k_L (m/s)	2.27×10^{-3}-4.56×10^{-3}	1.95×10^{-3}-2.94×10^{-3}
k_G (m/s)	3.94×10^{-3}-8.84×10^{-3}	2.09×10^{-2}-6.70×10^{-2}
a (m^2/m^3)	148.72-154.88	127-338

Table S2. Values of individual and overall mass transfer factors in RZB.

Item	**Value**
Rotor volume (cm^3)	665
G (m^3/h)	0.2-1.2
L (L/h)	25-40
N (rpm)	400-1200
T (K)	293.15-313.15
C_{NaOH} (kmol/m^3)	0.1-0.2
k_{L-I} (m/s)	1.26×10^{-3}-2.97×10^{-3}
k_{L-II} (m/s)	2.60×10^{-3}-5.46×10^{-3}
k_{L-III} (m/s)	1.43×10^{-3}-3.1×10^{-3}
k_L (m/s)	2.27×10^{-3}-4.56×10^{-3}
a_I (m^2/m^3)	16.69-21.33
a_{II} (m^2/m^3)	95.32
a_{III} (m^2/m^3)	36.68-39.4
a (m^2/m^3)	148.72-154.88
$k_{L-I}a_I$ (1/s)	0.021-0.059
$k_{L-II}a_{II}$ (1/s)	0.25-0.52
$k_{L-III}a_{III}$ (1/s)	0.053-0.12
k_La (1/s)	0.34-0.70
k_G (kmol/kPa m^2 s)	1.23×10^{-6}-2.85×10^{-6}
K_Ga (kmol/kPa m^3 s)	6.86×10^{-5}-1.04×10^{-4}