Correction to Estimation of Correlation between Electrical Conductivity and CO_2 Absorption in a Monoethanolamine Solvent System

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We have recognized the presence of some errors in eqs 12 and 13 on page 2382 of the original paper (*J. Chem. Eng. Data*, 2013, 58 (9), 2381−2388). They result from the wrong expression of the ionic strength (IS) range applied to the equation to calculate the ionic activity coefficient (r) of five MEA solvents. This error was due to our mistake. Therefore, eqs 12 and 13 were first corrected as below.

$$\log r = -0.5 z_+ z_- \frac{\sqrt{IS}}{1 + \sqrt{IS}} \quad \text{for } 0.01 \leq IS \leq 0.1 \tag{12}$$

$$\log r = -A z_+ z_- \left(\frac{\sqrt{IS}}{1 + \sqrt{IS}} - 0.2 IS \right) \quad \text{for } 0.1 < IS < 0.5 \tag{13}$$
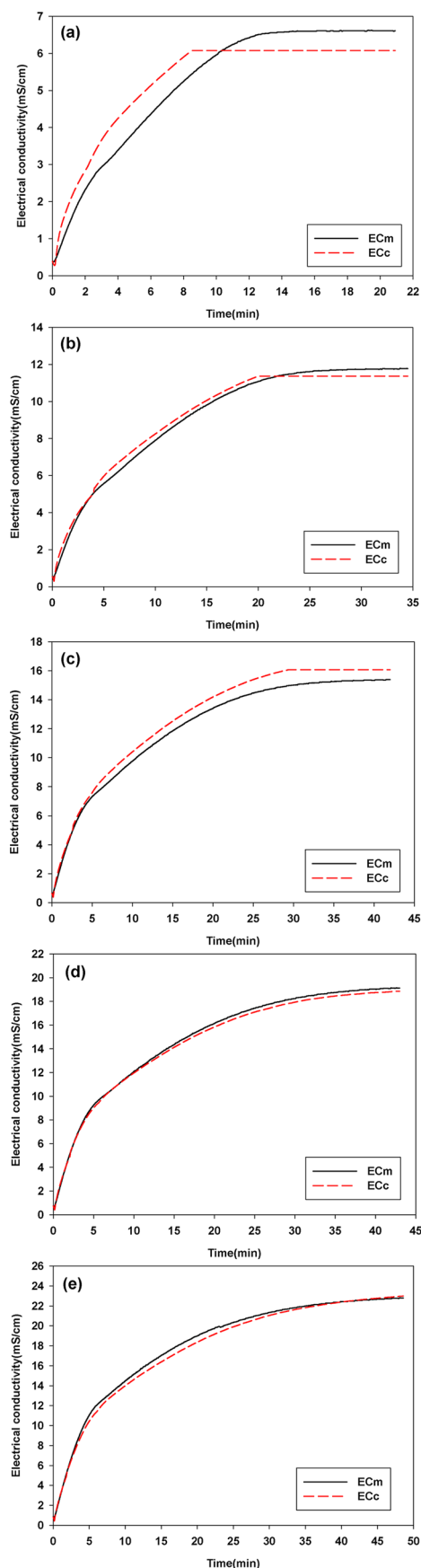
According to the corrections, some results such as the ionic conductivity of RNH_3^+ and $RNHCOO^-$, as well as the value of the calculated electric conductivity (EC) and correlation equation in the system were revised in the corrected paper. These include the text, Tables 2 to 4, and Figures 3 and 4. The corrections are detailed in the following text.

First, EC and ion concentrations in the initial and final states of five MEA solvents were used to estimate the ionic conductivity of RNH_3^+. Because IS values in the initial state of all solutions, that is, before carbonation, were under 0.01, it was appropriate that eq 11 was used to calculate their activity coefficients in the original paper. However, even though the IS values in the final state of the five MEA solvents were all between 0.1 and 0.5, the use of eq 12 to calculate their activity coefficients was invalid. The calculations should have been carried out according to the newly corrected eq 13. Therefore, minimum error to calculate the ionic conductivity of RNH_3^+ in the original paper, as expressed in eq 14, was recalculated and corrected to a new value. So, the minimum error of 1.752% in the sixth paragraph on page 2384 was corrected to 3.853% and the RNH_3^+ ionic conductivity of 73.60 $S \cdot cm^2 \cdot mol^{-1} \cdot z^{-1}$ was revised to 62.20 $S \cdot cm^2 \cdot mol^{-1} \cdot z^{-1}$ throughout the corrected paper.

Table 2. Value of Electric Charge and Equivalent Conductivity of Each Ion

ions	electric charge z	equivalent conductivity $S \cdot cm^2 \cdot mol^{-1} \cdot z^{-1}$
OH^-	−1	198.6
RNH_3^+	+1	62.20[a]
$RNHCOO^-$	−1	25.80[a]
HCO_3^-	−1	44.50

[a]Calculated and finally determined in the present study.

Table 3. Initial Concentration of RNH_3^+ (or OH^-) and Measured (EC_m) and Calculated (EC_c) EC at Initial and Final State of Each Solvent

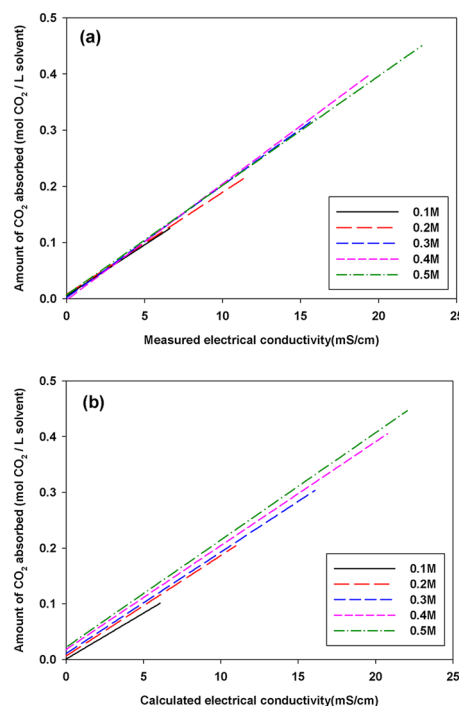| concentration of MEA solvent	initial state of solvent (before CO_2 absorption)			final state of solvent (after CO_2 absorption)	
	concentration of RNH_3^+ (or OH^-)	EC_m	EC_c	EC_m	EC_c
M	mM	$mS \cdot cm^{-1}$	$mS \cdot m^{-1}$	$mS \cdot cm^{-1}$	$mS \cdot cm^{-1}$
0.1	1.622	0.390	0.384	6.610	6.076
0.2	2.294	0.548	0.535	11.595	11.359
0.3	2.809	0.647	0.647	15.940	16.073
0.4	3.244	0.760	0.740	19.380	18.848
0.5	3.626	0.853	0.819	22.766	22.979

Table 4. Results of Least Square Fitting to Estimate Correlation Equations between EC and Amount of CO_2 Absorbed in Each Solvent

concentration of MEA solvent	EC_m			EC_c		
	slope	intercept	deviations	slope	intercept	deviations
M	mmol of $CO_2 \cdot cm \cdot L^{-1} \cdot mS^{-1}$ of solvent	mmol of $CO_2 \cdot L^{-1}$ of solvent	r^2	mmol of $CO_2 \cdot cm \cdot L^{-1} \cdot mS^{-1}$ of solvent	mmol of $CO_2 \cdot L^{-1}$ of solvent	r^2
0.1	18.14	5.112	0.990	16.49	0.731	0.996
0.2	18.18	7.635	0.996	18.02	6.308	0.993
0.3	20.02	1.817	0.997	18.21	10.69	0.995
0.4	20.65	−2.260	0.997	18.64	18.00	0.994
0.5	19.48	6.882	0.997	19.25	22.10	0.992

Figure 4. Correlation between (a) measured electrical conductivity (EC), and (b) calculated EC variation and the amount of CO_2 absorbed in each MEA solvent.

Second is the ionic conductivity of $RNHCOO^-$. Basically, it could be estimated by the same procedure as that used for RNH_3^+. However, unlike RNH_3^+, it is calculated based on the individually measured EC values of the five MEA solvents during the CO_2 absorption. The calculation of 0.1 M MEA solvent was valid in the original paper because its IS value did not exceed 0.1 until the reaction completion. However, the IS values of the other four MEA solvents exceeded 0.1. In the original paper, when the IS value exceeded 0.1 in the solvent, eq 12 was used to calculate its activity coefficient. However, this was our critical mistake due to the wrong expression of eqs 12 and 13. Therefore, they were recalculated by using the corrected eq 13, which afforded a new value of 25.80 $S·cm^2·mol^{-1}·z^{-1}$ for the ionic conductivity of $RNHCOO^-$. Therefore, this value has been substituted for 16.40 $S·cm^2·mol^{-1}·z^{-1}$ throughout the corrected paper. In addition, the minimum error of 6.92% in obtaining the ionic conductivity of $RNHCOO^-$ in the calculation was revised to the new value of 4.42% in the seventh paragraph on page 2384.

Third, as the ionic conductivity of RNH_3^+ and $RNHCOO^-$ were corrected, the EC_c at all absorption points during the carbonation reaction had to be recalculated. Therefore, the correlation equation between the EC variation and the amount of CO_2 absorbed in the system was revised, including the slope, intercepts, and deviations listed in Table 4. In addition, the maximum capacity of the amount of CO_2 absorbed and the EC_c of the five MEA solvents during the absorption were revised. Therefore, the values of 14.57 and 21.94 in the third paragraph on page 2387 were corrected to 16.49 and 19.25, respectively. In addition, the values of 0.3298 and 15.685 in the fifth paragraph on the same page were corrected to 0.3209 and 17.035, respectively.

Finally, based on the above explanations, the Tables and Figures relating to the corrections were corrected as shown. The Table of Contents graphic associated with this paper has also been corrected.

Figure 3. Variation of measured (EC_m) and calculated (EC_c) electrical conductivity according to CO_2 absorption in each MEA solvent: (a) 0.1 M, (b) 0.2 M, (c) 0.3 M, (d) 0.4 M, and (e) 0.5 M.

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dx.doi.org/10.1021/je5008636 | *J. Chem. Eng. Data* 2014, 59, 3944−3946