Journal of Solid State Electrochemistry (2021) 25:2699–2700
https://doi.org/10.1007/s10008-021-05039-0

CORRECTION

Correction to: Effects of environmental factors on key kinetic parameters relevant to pitting corrosion

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Published online: 31 August 2021

Correction to:
J Solid State Electrochem (2015) 19:3449–3461
https://doi.org/10.1007/s10008-015-2816-9

Equation 12 in the original article was incorrectly presented as:

$$DC_s = \frac{(i \cdot x)_{saltfilm}}{nF} + DC_{bulk,Cl}$$

The expression should correctly read:

$$D_{Cl}C_{sat,m} = \frac{(i \cdot x)_{saltfilm}}{nF} + \frac{D_{Cl}C_{bulk,Cl}}{n}$$

(13)

which follows from a rearrangement of Eq. 11, as shown here:

$$(i \cdot x)_{saltfilm} = FD_{Cl}nC_{sat,m} - FD_{Cl}C_{bulk,Cl}$$

$$\frac{(i \cdot x)_{saltfilm}}{nF} = D_{Cl}C_{sat,m} - \frac{D_{Cl}C_{bulk,Cl}}{n}$$

It is noted that Eq. 9 was presented incorrectly as:

$$(i \cdot x)_{saltfilm} = FD_{Cl}nC_{sat,m} - FD_{Cl}C_{s,Cl}$$

The expression should read:

$$(i \cdot x)_{saltfilm} = FD_{Cl}nC_{sat,m} - FD_{Cl}C_{b,Cl}$$

When Eq. 1 is expanded and the bulk concentration of the stainless steel cation $C_{m,\infty}$ is set to zero,

$$\frac{(i \cdot x)_{saltfilm}}{nF} = D_mC_{sat,m}$$

which when substituted into Eq. 13 above, gives:

$$D_mC_{sat,m} = D_{Cl}C_{sat,m} - \frac{D_{Cl}C_{bulk,Cl}}{n}$$

(14)

With these corrected equations, the discussion following Eq. 12 in the original article (until the section "E_{rp} or $E^{\ominus}$?") is revised and presented below. Note that Fig. 12 from the original article is also accordingly corrected and discussed in this context.

> Plots of $D_mC_{sat,m}$ vs. [Cl^-] can be converted into equivalent plots of $(i{\cdot}x)_{saltfilm}$ vs. [Cl^-] to examine the applicability of this approach to other 1-D pit data from the literature. To illustrate this utility, the $D_mC_{sat,m}$ vs. [Cl^-] data of Ernst and Newman [1] is replotted in terms of $(i{\cdot}x)_{saltfilm}$ assuming n = 2.2, in Fig. 12. Note that [Cl^-] has been converted from mol/kg to M (= mol/L). OLI Studio 10.0 (OLI Systems, Inc., Parsippany, NJ) was utilized to calculate these equivalent molarity values. The resulting slope of −0.14 is comparable to the value obtained from this study (−0.11), as well as with the work of Katona et al. (−0.12) [2]. Across a concentration range of 0.5 M ≤ [Cl^-] ≤ 4.3 M, which corresponds closely to the [Cl^-] encountered in many typical atmospheric conditions (>80% RH at 25 °C) [3], D_m and $C_{sat,\,m}$ can therefore be estimated from a straightforward diffusion-based analysis of experimental values of pit stability product under a salt film. Note that the analysis in this study assumed that the diffusion component of mass transport overwhelmed migration and that [Na^+] did not play an important role at the pit bottom. A recent full mass transport model

The original article can be found online at https://doi.org/10.1007/s10008-015-2816-9.

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by Nguyen and Newman [4] has shown that even with these effects considered, an analysis based on diffusion alone provides reasonably accurate estimates of parameters. These considerations also revealed that the value of D_m calculated from the measured pit stability product as presented in a diffusion-only analysis was actually an effective diffusion coefficient, which was higher than the true D_m, a similar conclusion to that presented in Gaudet et al. [5]

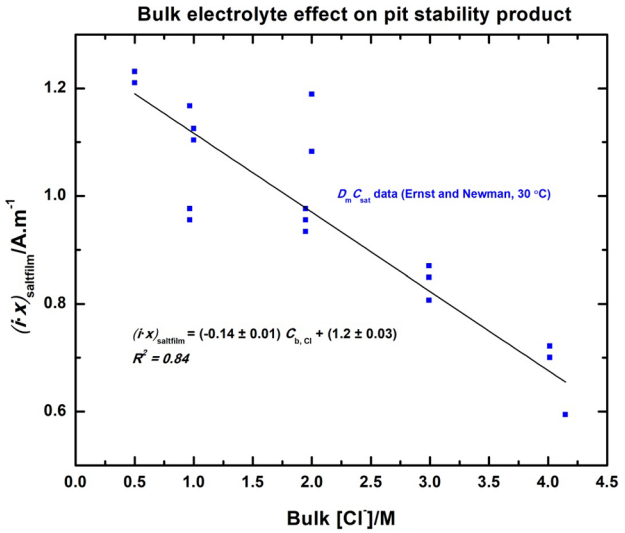

Figure 12 (corrected from original following revised analysis). Data from Ernst and Newman [1] replotted in terms of pit stability product

Additionally, some notation in the original article was not rendered clearly due to typographical errors in copy editing. Although the explanation presented in the article for the linear relationship between $(i{\cdot}x)_{\text{saltfilm}}$ and $[Cl^-]$ is not materially altered by these errors, the correct expressions are presented here for clarity (correct terms in boldface) in future reference. Note that the original article uses the terms C_b and C_{bulk} interchangeably throughout to refer to bulk concentration.

Equation 5 in the original article reads:

$$D_{Cl}\left(C_{s,Cl} - C_{1;,Cl}\right) = nD_m(C_{sat,m} - C_m)$$

The correct expression is:

$$D_{Cl}\left(C_{s,Cl} - \boldsymbol{C_{b,Cl}}\right) = nD_m(C_{sat,m} - \boldsymbol{C_{m,\infty}})$$

where $C_{m,\infty}$ is the bulk concentration of the metal cation, which is assumed to be zero.

Equation 6 in the original article reads:

$$(i \cdot x)_{saltfilm} = FnD_m\left(C_{sat,m} - C_s\right)$$

The correct expression is:

$$(i \cdot x)_{saltfilm} = FnD_m\left(C_{sat,m} - \boldsymbol{C_{m,\infty}}\right)$$

Equation 10 in the original article reads:

$$(i \cdot x)_{saltfilm} = FD_{Cl}nC_{sat,m} - FD_{Cl}C_{s,Cl}$$

The correct expression is:

$$(i \cdot x)_{saltfilm} = FD_{Cl}nC_{sat,m} - FD_{Cl}\boldsymbol{C_{b,Cl}}$$

References

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