Erratum to: The role of geometry in rough wall turbulent mass transfer

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1 Erratum to: Heat Mass Transfer DOI 10.1007/s00231-013-1165-4

Due to a miscommunication, an unfortunate error was not corrected before the appearance of [1] in Heat and Mass Transfer. The error pertains to the ratio of rough to smooth wall mass transfer coefficient k_{fR}/k_{fS} , Eq. (19) in [1]. Indeed, the correct equation is

$$\frac{k_{fR}}{k_{fS}} = \alpha + (1 - \alpha) \frac{\beta}{\gamma} Sc^{-1/3} Re_d^{-1}, \quad (1)$$

where $\alpha = (\lambda - w)/(\lambda + 2d)$ and $\beta = \frac{2\pi\sqrt{3}}{9} \left(\frac{b}{Sc_T}\right)^{-1/3}$ are the fraction of the crest surface area and a constant related to the mass transfer through the mass transfer boundary layer, respectively.

The equation above can be obtained by first establishing the relationship between decay coefficient and mass transfer coefficient for Dirichlet boundary conditions. Recall that the decay coefficients k_R and k_S for Robin boundary conditions are given by (Eqs. 3, 4 in [1]):

$$k_S = \frac{1}{Ur_{hS}} \frac{k_w}{1 + k_w/k_{fS}}, \quad (2)$$

$$k_R = \frac{1}{Ur_{hR}} \frac{k_w}{1 + k_w/k_{fR}}. \quad (3)$$

The behavior for Dirichlet boundary conditions ($C_w = 0$) can be obtained by taking the limit of $k_w \rightarrow \infty$, which results in

$$k_S = \frac{k_{fS}}{Ur_{hS}}, \quad k_R = \frac{k_{fR}}{Ur_{hR}} \quad (4)$$

and the ratio k_{fR}/k_{fS} is therefore given by

$$\frac{k_{fR}}{k_{fS}} = \frac{k_R r_{hR}}{k_S r_{hS}}. \quad (5)$$

Substitution of the model predictions for k_R/k_S , Eq. (18) in [1], immediately leads to (1).

The conclusions remain the same as in [1]: (1) the ratio k_{fR}/k_{fS} is not a pure power law; and (2) at high Sc and Re_d , the ratio is only dependent on the geometry of the wall surface.

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