Pergamon

Int. J. Heat Mass Transfer. Vol. 41, No. 14, p. 2259, 1998

Printed in Great Britain
0017–9310/98 $19.00+0.00

PII: S0017–9310(97)00213–5

LETTER TO THE EDITORS

Comments on "Experimental study of simultaneous heat and moisture transfer around single short porous cylinders during convection drying by a psychrometry method"

SSU-HSUEH SUN and THOMAS R. MARRERO

Capsule Pipeline Research Centre, College of Engineering, University of Missouri-Columbia, E2421 Engineering Building East, Columbia, MO 65211-2200, U.S.A.

(*Received* 17 *June* 1997)

In the recent paper by Sun and Marrero [1], eqn (4) incorrectly defined the Gukhman number as $(T_\infty - T_w)/T_{bp}$. This dimensionless parameter was used in Nusselt number correlations. Recently, we realized this error, corrected the correlations and found that the predicted Nusselt numbers change slightly, well within experimental error.

The correct definition of the Gukhman number is $(T_\infty - T_w)/T_\infty$, where T_∞ is the ambient air temperature, T_w is the wet bulb temperature of a moist surface [2]. For evaporation processes from moist surfaces into air, the Gukhman number is a measure of the maximum thermal driving force and accounts for the effects of humidity [3].

In the Nusselt correlation for heat transfer [1], eqn (15), the correct values for the Gukhman number were employed and linear regression analyses were performed. The result is a small change in the correlation, from

$$Nu = 0.056 Re^{0.65} Gu^{-0.43} \tag{15}$$

to

$$Nu = 0.059 Re^{0.65} Gu^{-0.44}. \tag{15*}$$

By the new correlation, eqn (15*), the difference in Nusselt numbers is less than 0.4% from the values calculated from eqn (15).

Similarly, in the Nusselt correlation for mass transfer or the Sherwood number [1], eqn (16), the correct values for the Gukhman number were employed. The published correlation,

$$Sh = 0.047 Re^{0.67} Gu^{-0.42} \tag{16}$$

is corrected to

$$Sh = 0.049 Re^{0.67} Gu^{-0.44}. \tag{16*}$$

By the new correlation the Sherwood number values are different by less than 10%.

This letter properly defines and employs the Gukhman number for the correlation of Nusselt and Sherwood numbers applicable to the drying of short porous cylinders. The revised correlations differ by less than 10% from the previously reported values. Even though the errors are relatively insignificant, we wish to bring these facts to your attention.

REFERENCES

1. Sun, S.-H. and Marrero, T. R., Experimental study of simultaneous heat and moisture transfer around single short porous cylinders during convection drying by a psychrometry method. *International Journal of Heat and Mass Transfer*, 1996, **39**, 3559–3565.
2. Land, N. S., *A Compilation of Nondimensional Numbers*. National Aeronautics and Space Administration, Washington, DC, 1972, p. 49.
3. Keey, R. B., *Drying Principles and Practice*. Pergamon, Oxford, 1972, p. 152.