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Corrigendum

A model for the thermal conductivity of unconsolidated porous media based on capillary pressure–saturation relation [Int. J. Heat and Mass Transfer 44 (2001) 247–251] ☆

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The authors regret that the following corrections should be made to the above technical note:

1. In the nomenclature (p. 248), the symbol f should be changed to $f(s)$, and its definition to the following: saturation factor of capillary pressure, taken as $J(s)$ in Eq. (4).

2. Sections 3 and 4 (pp. 250–251) should be as follows:

3. Results with discussions

In order to check the validity of the proposed model, the prediction for saturated or dry porous media was compared with other models such as Kunii and Smith [3], Zehner and Schlunder [4], the modified Z–S [5] and Nield models [13]. The results for the porous medium with $\lambda_s = 3.35$ W/m/K at saturated ($\lambda_l = 0.6$ W/m/K) and dry ($\lambda_g = 0.024$ W/m/K) conditions were shown in Fig. 6. For the dry situation, the results of the proposed model are close to that of Z–S model for larger porosity and close to that of the modified Z–S model for small porosity. At wet saturated situation, the results of present model are between the results of the Nield and Z–S models.

Table 1 showed the reasonable comparison with the experimental data given by Prasad et al. [1], in which λ_1, λ_2 and λ_3 are obtained from Zehner–Schlunder [4], Kunii and Smith [3] and Nield [13] models, respectively. λ_p is the prediction by the present model.

Noting that the effective thermal conductivity of wet unsaturated porous media is affected by porosity, wet saturation and thermal conductivity of the solid, liquid and gaseous phases, however, the effective thermal conductivity of wet unsaturated porous media of different porosity can be unified by introducing following parameter defined as [14]

$$\lambda_u = (\lambda - \lambda_{dry})/(\lambda_{wet} - \lambda_{dry}). \qquad (12)$$

Here λ_{dry} and λ_{wet} are the thermal conductivity of porous media at dry and saturated condition, which can be measured and empirically correlated for λ_u–s plot. Then, the effective thermal conductivity of wet unsaturated porous media can be derived as:

$$\lambda = \lambda_u(\lambda_{wet} - \lambda_{dry}) + \lambda_{dry}. \qquad (13)$$

4. Conclusions

In conclusion, the variation of capillary pressure with saturation reflects the internal structure of wet unsaturated porous media and the probable contribution of solid, liquid and gas phase. The proposed model may effectively predict

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the thermal conductivity of both saturated and wet unsaturated unconsolidated porous media. The comparisons with the experimental data for saturated porous media show that the present model is reasonable and feasible to predict the thermal conductivity of porous media. It is difficult to obtain a unified equation about the thermal conductivity of wet unsaturated porous media for all conditions. When $\lambda_l/\lambda_s < 0.2$, Eq. (13) can be used to predict the effective thermal conductivity, i.e.,

$$\lambda = \lambda_u(\lambda_{wet} - \lambda_{dry}) + \lambda_{dry}.$$

3. Fig. 6 (p. 450) should be revised. This revised version is printed below.

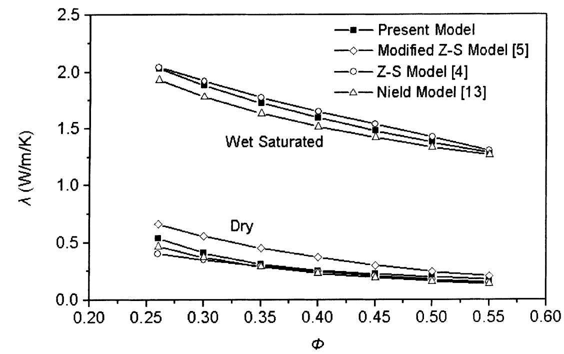

Fig. 6.

4. Figs. 7 and 8 (p. 250) should be deleted.
5. The last column on Table 1 (p. 251) should be corrected (see revised table below).

Table 1
The comparison with experiments

Medium	ϕ	λ_s	λ_f	λ_1	λ_2	λ_3	Measured	λ_p
1 Water/glass	0.369	1.10	0.616	0.855	0.831	0.857	0.837	0.895
2 Water/glass	0.425	1.10	0.618	0.840	0.810	0.847	0.842	0.869
3 Glycol/glass	0.349	1.10	0.259	1.515	0.656	0.608	0.559	0.645
4 Glycol/glass	0.427	1.10	0.259	1.371	0.555	0.553	0.597	0.579
5 Glycol/steel	0.416	37.39	0.262	5.848	2.167	2.389	2.584	1.358
6 Glycol/acrylic	0.402	0.16	0.261	0.450	0.206	0.195	0.221	0.198
7 Water/acrylic	0.427	0.16	0.630	0.292	0.371	0.279	0.479	0.324

6. An extra reference [14] should be added on p. 251. That reference is as follows:

[14] C.M. Xia, Experimental investigation using thermoelectricity analogy method and numerical modeling on thermal conductivity of granular porous media, MS thesis, Tsinghua University, 1998.