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Reply

Authors' reply to the comments of Song et al.

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We thank Song et al. for their comments. They enabled us to make further explanations on the new technique which was introduced in our paper [1]. In their letter, Song et al. addressed two issues.

1. Selection of the following boundary condition for the calculation of λ^2 was wrong: $x=0\ A^{\circ}=A^{\circ 1}$

The well known Danckwerts [2] boundary condition is as follows:

At $x=0$

$$(u_0 A^{\circ 1}/\epsilon)=(u_0 A^{\circ}/\epsilon)-D_L(\mathrm{d}A^{\circ 1}/\mathrm{d}x) \quad (1)$$

where u_0 is the superficial velocity. When axial dispersion is insignificant, as stated in our paper [1], Eq. 1 reduces to:

$A^{\circ}=A^{\circ 1}$ at the entrance ($x=0$)

This is the case of step input, and we simply used this boundary condition.

2. λ^2 should be a constant whereas the authors found λ^2 to be a function of t.

We also stated that λ^2 is a constant after Eq. (11) of our paper [1] and as a logical consequence of this statement: $\mathrm{d}\lambda/\mathrm{d}t=0$. Differentiating Eq. (16) of our paper [1] and making use of $\mathrm{d}\lambda/\mathrm{d}t=0$ one obtains following criterion at which $\mathrm{d}A^{01}/\mathrm{d}t$ is the time difference of A^{01} at the column inlet.

$$\frac{\mathrm{d}A^{\circ 1}}{\mathrm{d}t}=\left(\frac{\alpha^2}{A^{\circ 1}-\alpha}\right)\frac{1}{t}\ln\left(1-\frac{A^{\circ 1}}{\alpha}\right) \quad (2)$$

where $\alpha=(P_1/\mathrm{He})-\Phi(P_2-P_1)/\mathrm{He}$

Eq. 2 is unconditionally satisfied due to the inherent nature of λ^2 that is used as a constant during the employment of separation of variables technique.

Nomenclature

Unless otherwise stated in the reply, the same as for [1].

References

[1] V. Evren and A.R. Özdural, *Chem. Eng. J.*, 57 (1995) 67.
[2] P.V. Danckwerts, *Chem. Eng. Sci.*, 2 (1953) 1.

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