LETTERS TO THE EDITOR

To the Editor:

Rajab Khalilpour et al. have recently published an interesting article[1] on modeling membrane systems for postcombustion CO_2 capture. However, there are a number of points that seem to require some clarification.

1. One of the assumptions leading to Eq. 9 is

$$d(x_i\, F_f) = y_i\, dF_f \tag{1}$$

This assumption is, however, incompatible with Eq. 3, nor can it be reconciled with the statement that *the concentration of permeate changes through the fiber length*. This flaw seems to result from the fact that the authors do not distinguish between the averaged concentration over the differential element dZ (which is indeed y_i) and the local unperturbed mole fraction on the permeate side y_i^* (cf. Tanczyk et al.[2] and Figure 1).

The correct form should, thus, be either

$$d(x_i\, F_f) = y_i\, d\, F_f - (F_{f0} - F_f) d\, y_i \tag{2}$$

(which follows directly from Khalilpour et al.'s Eq. 3) or, alternatively

$$d(x_i\, F_f) = y_i^*\, d\, F_f \tag{3}$$

It is difficult to assess the impact of the seemingly erroneous form of Eq. 9 upon the final conclusions, but the figures may require some modification.

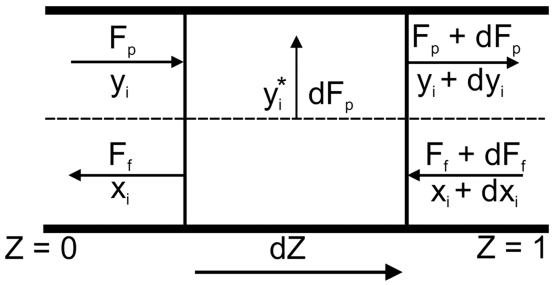

Figure 1. Mass fluxes and concentrations in a differential section of the countercurrent membrane module.

2. Figures 2 and 3 (alongside comments scattered throughout the article) refer to a physically unrealistic case when the permeate flows against its own pressure gradient along the fiber. Unless some additional assumptions have been tacitly made by the authors, such a flow pattern can hardly represent any practical situation.

Notation

F_f = feed flow rate, mol/s
F_{f0} = inlet feed flow rate, mol/s
F_p = permeate flow rate, mol/s
x_i = feed-side mole fraction of component i
y_i = permeate-side mole fraction of component i
y_i^* = local "equilibrium" mole fraction of component i on the permeate side
Z = dimensionless length of the hollow fiber

Literature Cited

1. Khalilpour R, Abbas A, Lai Z, Pinnau I. Modeling and parametric analysis of hollow fiber membrane system for carbon capture from multicomponent flue gas. *AIChE J*. 2012;58:1550–1561.
2. Tanczyk M, Warmuzinski K, Janusz-Cygan A, Jaschik M. Investigation of membrane performance in the separation of carbon dioxide. *Chem Proc Eng*. 2011;32:291–298. doi:10.2478/v10176-011-0023-5).

Krzysztof Warmuzinski, Marek Tanczyk, and Manfred Jaschik
Institute of Chemical Engineering
Polish Academy of Sciences
ul. Baltycka 5, 44-100 Gliwice, Poland
E-mail: kwarmuz@iich.gliwice.pl.

AIChE Journal, Vol. 58, 3928, (2012)

DOI 10.1002/aic.13916
Published online October 9, 2012 in Wiley Online Library (wileyonlinelibrary.com).