because experiments designed to test the hypothesis of complete mixing in the interstices of particles in a fixed bed have not substantiated that hypothesis (Gunn and Pryce, 1969). However, irrespective of which model is favored, our analysis supports the characterization of mixing in fixed-bed reactors by experiments carried out under nonreacting conditions.

Aris and Amundson (1957) set equivalence between the dispersion and cell models by separately equating the first moments and the second moments of the impulse responses for each model. When the mixing length of the cell model was taken as the particle diameter d, they found the Peclet group to be equal to 2. As Eq. 12 holds for both models, it follows that the equivalence condition is the same when there is a system of isothermal first-order reactions occurring in the bed.

The appeal of this result in its simplicity is all the greater because the value of the Peclet group in beds of spheres at high Reynolds number is about 2 (McHenry and Wilhelm, 1957; Gunn and Pryce, 1969). Aris and Amundson's result is based on the hypothesis of one particle diameter for the mixing length. It is of interest to note that another compulsive hypothesis for a different theoretical approach leads to the same result.

In a study of convective mixing in fixed beds, Gunn (1969) considered the probability of axial displacement of a fluid particle placed within a small group of solid, fixed particles in the bed. If p is the probability of axial displacement he showed that the axial Peclet group is

$$Pe = \frac{2p}{1 - p} \tag{20}$$

If the probability of axial displacement of the fluid particle is equal to the probability of the particle remaining stationary, Eq. 20 gives Pe to be 2.

Notation

A = defined by Eq. 2
$c, c_i, c_{i,n}$ = concentration vector and components
C_0 = initial concentration vector
d = particle diameter
D_L = coefficient of axial dispersion
f_i = linear reaction function
k, k_ℓ = first-order reaction velocity constant
$\boldsymbol{K}$ = matrix of first order reaction velocity constants
n = cell number
r = order of matrix $\boldsymbol{K}$
p = probability of axial displacement
Pe = axial Peclet group Vd/D_L
q = volumetric flowrate through unit cross-section
t = time
V = velocity, interstitial
x = axial coordinate

Greek letters

$\alpha = qt/\epsilon d$
ϵ = porosity
ϕ, ψ = reaction velocity functions
μ_s = moment of order s defined by Eq. 8

Subscripts

f = inlet
L = axial
n = cell number = 0, 1, 2. . .
NR = without reaction
R = with reaction

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Errata

Equation 16 of the paper titled "Effects of Osmotic Pressure and Adsorption on Ultrafiltration of Ovalbumin" (June 1990, p. 911) should read:

$$Sh = 1.62\left(\frac{Re\ Sc\ d_h}{L}\right)^{1/3} \tag{16}$$