Errata

Chapter: 2
Channel Flow

Page: 45

Equation: 2.109

Replace "$\forall$" by "$\forall_o$"

Chapter: 3
Transport Laws

Page: 94

Equation: 3.106

Replace $w_4 \frac{1}{\rho T} \overline{\frac{\partial p}{\partial x_i}}$ with $w_4 \frac{1}{\rho T} \overline{\frac{\partial p}{\partial x_i} \frac{\partial T}{\partial x_j}}$.

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Problem 3.2: Replace '$\frac{xn^2}{Z}$' with '$\frac{xn^2}{2}$'.

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Problem 3.5(a): Delete 'of problem 1(b)'.

Chapter 4
Diffusion Dispersion and Mixing

Page: 117

The sentence, "If we change the ......" should be modified as:
If we change the velocity to 1.0 mm/sec, we have:

$T_{convection, 1}$ = $T_{convection, 2}$ = 1 mm/(1 mm/sec) = 1 sec

Chapter: 5
Surface Tension – Dominated Flows

Page: 159

Equation: 5.16

'dE' should be replaced by 'dG'.

Equation: 5.17

'$\frac{dE}{dx}$' should be replaced by '$\frac{dG}{dx}$'.

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Equation: 5.22

'dE' should be replaced by 'dG'.

Page: 178

Equation: 5.69

'$\frac{2\,\sigma_{front}}{a}$' should be replaced by '$\frac{2\,\sigma_{front}}{a}\cos\theta_{front}$'.

Equation: 5.70

'$\frac{2\,\sigma_{rear}}{a}$' should be replaced by '$\frac{2\,\sigma_{rear}}{a}\cos\theta_{rear}$'.

Equation: 5.71

'$\frac{2}{a}(\sigma_{front}-\sigma_{rear})$' should be replaced by '$\frac{2}{a}(\sigma_{front}\cos\theta_{front}-\sigma_{rear}\cos\theta_{rear})$'.

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Equation: 5.84

'$\frac{\sigma_T {\beta_h}^2}{\mu}$' should be replaced by '$\frac{\sigma_T {\beta_h}^2}{\mu\alpha}$'.

Chapter: 6
Charged Species Flow

Page: 232

Equation: 6.70

'$\frac{\varepsilon}{K_{el}}\frac{L}{\lambda_D}$' should be replaced by '$\frac{\varepsilon L}{2K_{el}\lambda_D}$'.

Equation: 6.71

'$3.6\,ms$' should be replaced by '$3.6\,ns$'.

Equation: 6.72

'$1.7\,KHz$' should be replaced by '$1.7\,GHz$'. The line below it should also be 'Gigahertz' instead of 'Kilohertz'.

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Equation: 6.121

The '$+$' sign should be replaced by '$-$' sign.

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Problem 6.2: Replace '. . . radius a of 1 m' with '. . . radius a of 1 μm'.

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Problem 6.2: Delete part (d).

Chapter: 7
Magnetism and Microfluidics

Page: 291

Equation 7.42: Multiply "μ_0" in the first right hand side term of the equation

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Equation 7.45: Multiply "μ_0" in the first right hand side term of the equation

Page: 301

Problem 7.1: "channel" should be replaced by "DC MHD pump uses channel"

and "has depth" should be replaced by "with depth"

and "magnetic field" should be replaced by "perpendicular magnetic field".

Problem 7.2: "channel" should be replaced by "DC MHD pump uses channel"

and "dimension is" should be replaced by "of dimension".

Problem 7.3: "12 mA" should be replaced by "12 mA current"

and "10 mA" should be replaced by "10 mA current".

Delete " 5 mA NACl".

Chapter: 8
Microscale Conduction

Page: 317

Equation: 8.36

Replace '$\dfrac{\frac{1}{(\epsilon-\mu)}}{e^{K_BT+1}}$' by '$\dfrac{1}{e^{\frac{(\epsilon-\mu)}{K_BT}}+1}$' .

Equation: 8.36

Replace 'n_e' by 'N_e'. Similarly, 'n_e' should be replaced by 'N_e' in the sentence below Equation 8.38.

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Equation: 8.46

'$\dfrac{1-2\lambda_{mfp}}{(3\pi L)}$' should be replaced by '$1-\dfrac{2\lambda_{mfp}}{(3\pi L)}$' .

Equation: 8.47

'$\dfrac{1-\lambda_{mfp}}{3L}$' should be replaced by '$1-\dfrac{\lambda_{mfp}}{3L}$' .

Chapter: 9
Microscale Convection

Page: 363

Replace '$\frac{160}{9}\frac{(\sigma\rho_f - 3\mu_f G)}{\sigma^2}$' by '$\frac{169}{9}\frac{(\sigma\rho_f - 3\mu_f G)}{G^2}$'.

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'$Su_g = \frac{\rho_g \sigma D}{\mu_g^2} X_{++} = $' should be replaced by '$Su_g = \frac{\rho_g \sigma D}{\mu_g^2} = X_{++} = $'.

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Replace '$\left(\frac{dp}{dz}\right)_g = \frac{-2f_f r_f G^2 x^2}{D_h}$' by '$\left(\frac{dp}{dz}\right)_g = \frac{-2f_g r_g G^2 x^2}{D_h}$'.

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Problem 9.2: Insert "of 1.0 W/m²" after "surface heat flux".

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Problem 9.3: Replace "problem 2.0" with "problem 9.2".

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Problem 9.4: Replace "problem 2.0" with "problem 9.2".

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Table 9.5: μ_f =6.01 × 10⁻⁴ kg/m-s, μ_g =4.116 × 10⁻⁴ kg/m-s

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Table 9.8: Use the following properties

$$T_{sat} = 529.36 \text{ K}, \rho_f = 789.52 \text{ kg/m}^3, \rho_g = 22.224 \text{ kg/m}^3, h_f = 1116.2 \text{ kJ/kg},$$
$$h_g = 2798.5 \text{ kJ/kg}, K_f = 610.09 \times 10^{-3} \text{ W/m-K}, \mu_f = 103.48 \times 10^{-6} \text{ Pa-s}, \mu_g = $$
$$17.663 \times 10^{-6} \text{ Pa-s}, \sigma = 24.582 \times 10^{-3} \text{ N/m}, C_{p,f} = 4.9395 \text{ kJ/kg-K}$$

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Problem 9.9: Replace "incipience quality" with "incipience dry out quality".

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Problem 9.10: Replace "132 bar" with "1.0 bar".

Use the following properties:

Properties for this problem can be used are as follows:

(a) $P_R = 0.0045$, $P_{sat} = 0.0992$ MPa, $T_{sat} = 452.68$ K, $\rho_f = 634.97$ kg/m³, $\rho_g = 79.95$ kg/m³, $h_f = 1539.4$ kJ/kg, $h_g = 2657.9$ kJ/kg, $K_f = 497.87 \times 10^{-3}$ W/m-K, $\mu_f = 73.613 \times 10^{-6}$ Pa-s, $\mu_g = 21.707 \times 10^{-6}$ Pa-s, $\sigma = 7.27 \times 10^{-3}$ N/m, $C_{p,f} = 7.3559$ kJ/kg-K

(c) $P_R = 0.6$, $P_{sat} = 132$ bar, $T_{sat} = 605.1$ K, $\rho_f = 634.97$ kg/m³, $\rho_g = 79.95$ kg/m³, $h_f = 1539.4$ kJ/kg, $h_g = 2657.9$ kJ/kg, $K_f = 497.87 \times 10^{-3}$ W/m-K, $\mu_f = 73.613 \times 10^{-6}$ Pa-s, $\mu_g = 21.707 \times 10^{-6}$ Pa-s, $\sigma = 7.27 \times 10^{-3}$ N/m, $C_{p,f} = 7.3559$ kJ/kg-K

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Problem 9.11: Insert "P_{crit}=18.68 bar" after "P_{sat}=1.0 bar".

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Problem 9.13: Use, G = 250 kg/m²-s.

The properties of CO_2 are as follows.

$T_{sat} = -16.2$ °C $= 256.93$ K, $P_{sat} = 2.194$ MPa, $\rho_f = 1014.9$ kg/m³, $\rho_g = 58.0$ kg/m³, $h_f = 162.19$ kJ/kg, $h_g = 436.5$ kJ/kg, $K_f = 130.32 \times 10^{-3}$ W/m-K, $\mu_f = 131.37 \times 10^{-6}$ Pa-s, $\mu_g = 13.368 \times 10^{-6}$ Pa-s, $\sigma = 7.6458 \times 10^{-3}$ N/m, $C_{p,f} = 2.208$ kJ/kg-K

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Problem 9.15: Replace "(b) P_{sat}= 1 bar, T_{sat}=-73.8 °C, P_R=0.014" with "(b) P_{sat}= 7.38 bar, T_{sat}=-48 °C, P_R=0.1"

Use the following properties:

At $P_{sat} = 36.9$ bar, $T_{sat} = 2.2$ °C, $P_R = 0.5$:
$\rho_f = 914.14$ kg/m³, $\rho_g = 104.66$ kg/m³, $h_f = 205.36$ kJ/kg, $h_g = 429.54$ kJ/kg, $K_f = 107.77 \times 10^{-3}$ W/m-K, $\mu_f = 95.616 \times 10^{-6}$ Pa-s, $\mu_g = 15.024 \times 10^{-6}$ Pa-s, $\sigma = 4.9925 \times 10^{-3}$ N/m, $C_{p,f} = 2.614$ kJ/kg-K

At $P_{sat} = 7.38$ bar, $T_{sat} = -48$ °C, $P_R = 0.1$:
$\rho_f = 1147.3$ kg/m³, $\rho_g = 19.335$ kg/m³, $h_f = 96.804$ kJ/kg, $h_g = 433.27$ kJ/kg, $K_f = 169.54 \times 10^{-3}$ W/m-K, $\mu_f = 221.8 \times 10^{-6}$ Pa-s, $\mu_g = 11.415 \times 10^{-6}$ Pa-s, $\sigma = 14.51 \times 10^{-3}$ N/m, $C_{p,f} = 1.977$ kJ/kg-K

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Problem 9.17: Replace "at HFE" with "of HFE"

Replace, "D_H=0.5 μm" with "D_H=1.76 μm"

Replace, "$T_{in}=0\ ^oC$" with "$T_{in}=0\ ^oC$, $x_{in}=-0.65$"

Replace, "$T_{in}=-20\ ^oC$" with "$T_{in}=0\ ^oC$, $x_{in}=-0.85$"

Outlet pressure is 1.14 bar.