Chemical Reactor Analysis and Design Fundamentals

Errata for First Edition, Second Printing

July 16, 2019

1. p. 43, three lines above first equation, change "Equation 2.27" to "Reaction 2.26." Thanks to Manos Mavrikakis of UW for pointing out this erratum.
2. p. 78, last equation, replace ΔC_P with ΔC_P°. Thanks to Carlos Henao of UW for pointing out this erratum.
3. p. 91. Change $\varepsilon_1, \varepsilon_2$ to $\varepsilon_1', \varepsilon_2'$, respectively, in second to last displayed equation and sentence preceding it.
4. p. 91, last paragraph, change "the production of 2,2,4 is preferable" to "the production of 2,2,3 is preferable." Thanks to Manos Mavrikakis of UW for pointing out this erratum.
5. p. 103, Exercise 3.10 (b), change "ideal mixture" to "ideal-gas mixture."
6. p. 103, third line from bottom. Change $\pi(n-1)$ to $\pi(n+1)$.
7. p. 104, first equation, change $\sum_j \mu_j n_j$ to $\sum_j \mu_j dn_j$.
8. p. 128, sentence after Equation 4.39, should read "One can divide Equation 4.38 through by $Q_f \ldots$". Thanks to Nathan Knapp of Oregon State University for pointing out this erratum.
9. p. 133, sentence after first equation, should read "…replace a high-concentration species mole balance with the total mass balance …" Thanks to Carlos Henao of UW for pointing out this erratum.
10. p. 146, p. 155, remove extraneous "eq :" in Equation 4.70 on p. 146 and equation for c_j on p. 155.
11. p. 165, first sentence should read, "If r_{tot} is the total reaction rate, $r_{\text{tot}} e^{-r_{\text{tot}}\widetilde{t}}$ is the probability that a reaction has not occurred during time interval $\widetilde{t}$ …"
12. p. 168, Equation 4.93, add units of 1/day to the rate constants. Thanks to Elise Huang of UW for pointing out this erratum.
13. p. 177, Exercise 4.8, change units of E_a to kcal/mol. Thanks to Ryan West of UW for pointing out this erratum.
14. p. 179, Exercise 4.12, part (b), change "gas flowrate" to "volumetric flowrate." Thanks to Charlie Hill of UW for pointing out this erratum.
15. p. 181, Exercise 4.17, change units of k_1 from mol/L·min to L/mol·min. Thanks to Yong Ku Cho of UW for pointing out this erratum.
16. p. 242, Equation 5.135, change K_{CO} to K_1. Thanks to Irene Chen of UW for pointing out this erratum.

17. p. 258, expression for k_{eff}. Change k_5 to k_{-4} and k_6 to k_{-1}. Thanks to Camo Cotten of UW for pointing out this erratum.
18. p. 261, Exercise 5.6, 3 lines from end. Change the list (CH_3, CH_3CO and CHO) to (CH_3 and CH_3CO). Thanks to Tania Deb and Chris Barrett of UW for pointing out this erratum.
19. p. 266, Exercise 5.19, first line. Change "hydrogen" to "ethane." Thanks to Kevin Henneck of Princeton University for pointing out this erratum.
20. p. 266, add "+S" to the right-hand side of the last reaction in Exercise 5.19. Thanks to Andrew Stella of Princeton University for pointing out this erratum.
21. p. 285, sentence before first equation, replace "specific volumes" with "specific internal energies." Thanks to Carlos Henao of UW for pointing out this erratum.
22. p. 288, last line. Change -5.33 to -5.4. Thanks to Sam Toan of U. Minnesota-Duluth for pointing out this erratum.
23. p. 304, Add $T_a = 298$ K to Table 6.3. Thanks to Mike Donnelly of UW for pointing out this erratum.
24. pp. 323–324. Table 6.5, change k_m value from 1922.6 to 2.0822; change ΔH_R value from -1.361×10^3 to -1.284×10^6. With these changes the corrected Figures 6.36 and 6.37 are shown here. Thanks to Matt Kipper of Colorado State for pointing out this erratum.
25. p. 328, Table 6.6. Change Q_f to 0.05713 m^3/s.
26. p. 329. Figure 6.39 is not quite correct. The corrected figure is shown here in Figure 6.39.
27. p. 330. The middle steady-state profiles in Figures 6.40 and 6.41 are not quite correct. The corrected figures are shown here in Figures 6.40 and 6.41.
28. p. 340, replace A_h with A in the table for Exercise 6.6.
29. p. 340, replace E/RT with E/T in the reaction rate expression in Exercise 6.7. Thanks to Anita Gilgenbach of UW for pointing out this erratum.
30. p. 340. Note that Exercise 6.7 is a duplicate of Exercise 6.4.
31. p. 343, Exercise 6.14 (e). replace

    "If the equilibrium conversion of component A determined in 6.14d is achieved in the *adiabatic* reactor, calculate the outlet temperature using the inlet conditions specified in 6.14d."

    with

    "Calculate the minimal inlet temperature of an *adiabatic* reactor required to achieve the equilibrium conversion of component A determined in 6.14d."
32. p. 344, Exercise 6.16, replace "in a PFR" with "in an adiabatic PFR."
33. p. 347, Figure 6.42 is not quite correct. The corrected figure is shown here in Figure 6.42.

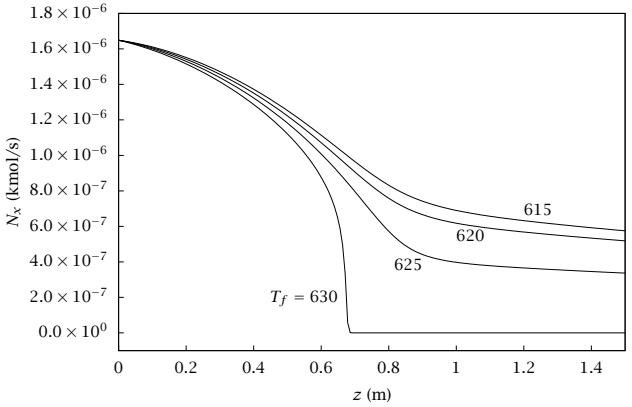

Figure 6.36: Molar flow of o-xylene versus reactor length for different feed temperatures.

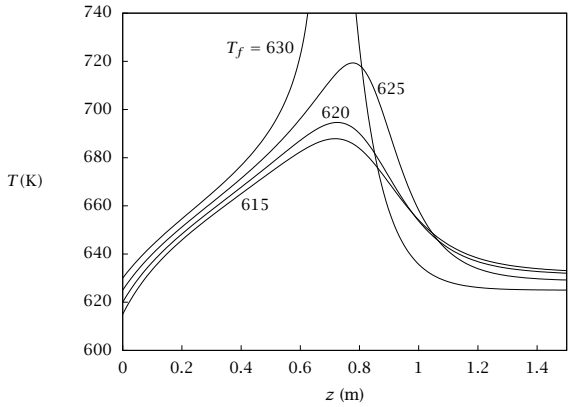

Figure 6.37: Reactor temperature versus length for different feed temperatures.

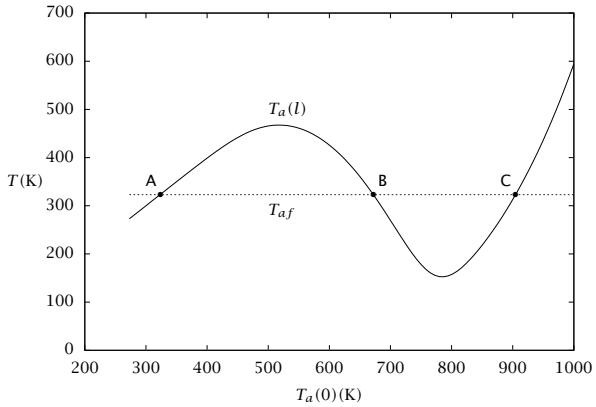

Figure 6.39: Coolant temperature at reactor outlet versus temperature at reactor inlet, $T_a(l)$ versus $T_a(0)$; intersection with coolant feed temperature T_{af} indicates three steady-state solutions (A,B,C).

34. p. 378, change the upper limit of integration from c to $\overline{c}$ in the equation preceding Equation 7.50.

35. p. 394, Table 7.5, change the units of k_{10} and k_{20} to cm^3/mol·s. Thanks to Ralph White of South Carolina for pointing out this erratum.

36. p. 396, third equation. Insert a minus sign on the right-hand side. Fourth and fifth equations: change minus sign to plus sign. Thanks to Ralph White of South Carolina for pointing out this erratum.

37. p. 404, displayed equation before Equation 7.84. Factor of $\sqrt{2}$ missing from numerator. Thanks to Amy Claas of UW for pointing out this erratum.

38. pp. 405–407, Example 7.6. Change the reactor feed sentence to, "The feed to the reactor consists of 16.7 mol% CO, 83.3 mol% O_2 and zero CO_2, with volumetric flowrate $Q_f = 792$ L/s." Thanks to Khalifa Yousif of UW for reporting this erratum. The rate constant should be $k = 1.3828 \times 10^{19} \exp(-13,500/T)$. With the adjusted rate constant and flowrate given above, the reactor volume should be $V_R = 233$ cm^3 instead of L. Also change the units on the x-axis from L to cm^3 in Figures 7.27 and 7.28. Thanks to Jason Haugh and the students at NC State for reporting this erratum.

39. p. 405, seventh line from bottom. Replace "The catalyst pellet radius is 0.1 cm." with, "The spherical catalyst pellet radius is 0.1 cm, and the densities are $\rho_p = 0.68$, $\rho_B = 0.60$ g/cm^3."

40. p. 412, Equations 7.87 and 7.91, and page 415. Change k_{jm} to k_{mj}. Thanks to Robert Erickson of UW for pointing out this erratum.

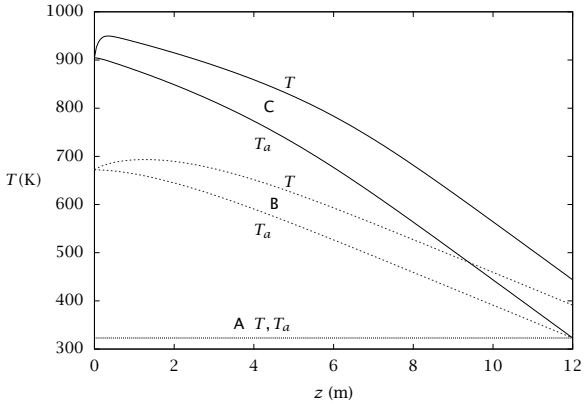

Figure 6.40: Reactor and coolant temperature profiles versus reactor length; lower (A), unstable middle (B), and upper (C) steady states.

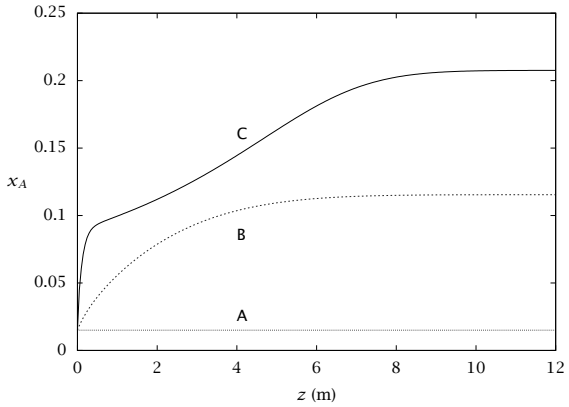

Figure 6.41: Ammonia mole fraction versus reactor length; lower (A), unstable middle (B), and upper (C) steady states.

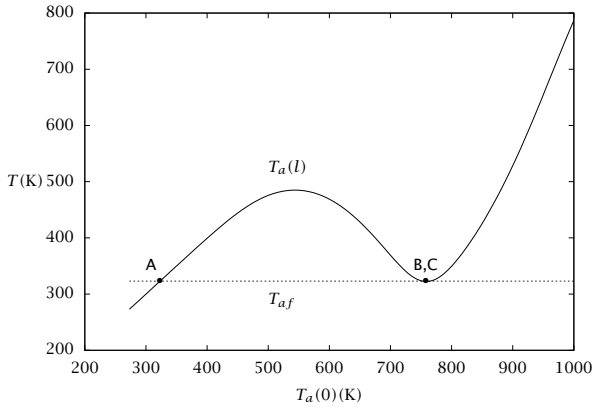

Figure 6.42: Coolant temperature at reactor outlet versus temperature at reactor inlet, $T_a(l)$ versus $T_a(0)$, at the critical value of heat-transfer coefficient; upper and middle steady-state solutions have coalesced.

41. p. 425, Exercise 7.19, ninth line. Change "diameter" to "area." Thanks to Natalie Altvater of UW for pointing out this erratum.

42. p. 448, Figure 8.12, time should have units of minutes. Thanks to Ralph White of U. South Carolina, for pointing out this erratum.

43. p. 463, change $c_A(\theta)$ to c_{At} in first line after the two unnumbered equations. Thanks to Manos Mavrikakis of UW for pointing out this erratum.

44. p. 520. Second line from top. Change 0.05 to 0.025. Thanks to Travis Arnold of UW for pointing out this erratum.

45. p. 531, equation should read

$$T_m = \frac{2}{1/300 + 1/500} = 375 \text{ K}$$

Thanks to Henning Stotz of UW for pointing out this erratum.

46. p. 549, change right-hand side of last equation to $k_2 c_C c_B V_R$. Thanks to Manos Mavrikakis of UW for pointing out this erratum.

47. p. 553. Change concentration (kmol/dm^3) to total amount (kmol) in y-axis labels and captions of Figures 9.33 and 9.34. Change figure labels c_j to n_j. Thanks to Joel Andersson of UW for pointing out this erratum.

48. p. 564, insert a minus sign on right-hand side of r_l equation in item 1.

49. p. 565, Exercise 9.6. Change “Use the least-squares method of this chapter and find …” to “Use an ODE/sensitivity solver and optimizer to find …”.

50. p. 567. Figure 9.41. Exchange the figure labels c_A and c_B.

51. p. 588, integral should read $\int_0^1 f(r)dr = \sum_{j=1}^{n_c} Q_j f(r_j)$.