
Problem Set 13

Problem 10.44

Following are data for G^E and H^E (both in J/mol) for equimolar mixtures of the same organic liquids. Use all of the data to estimate values of G^E , H^E , and TS^E for the equimolar mixture at 25 °C.

At $T = 10\text{ °C}$, $G^E = 544.0$ and $H^E = 932.1$

At $T = 30\text{ °C}$, $G^E = 513.2$ and $H^E = 893.4$

At $T = 50\text{ °C}$, $G^E = 494.2$ and $H^E = 845.9$

Problem 12.3

The pressure above a mixture of ethanol and ethyl acetate at 70 °C is measured to be 86 kPa. What are the possible compositions of the liquid and vapor phases?

Problem 12.4

The pressure above a mixture of ethanol and ethyl acetate at 70 °C is measured to be 78 kPa. What are the possible compositions of the liquid and vapor phases?

Problem 13.1

Assuming the validity of Raoult's Law, do the following calculations for the benzene(1)/toluene(2) system:

- (a) Given $x_1=0.33$ and $T=100\text{ °C}$, find y_1 and P .
- (b) Given $y_1=0.33$ and $T=100\text{ °C}$, find x_1 and P .
- (c) Given $x_1=0.33$ and $P=120\text{ kPa}$, find y_1 and T .
- (d) Given $y_1=0.33$ and $P=120\text{ kPa}$, find x_1 and T .

Report temperature in °C and pressure in kPa.

Problem 13.6

Of the following liquid/vapor systems, which can be approximately modeled by Raoult's Law? For those which cannot, why? Table B.1 in Appendix B may be useful.

- (a) Benzene/toluene at 1 atm.

- (b) n-Hexane/n-heptane at 25 bar.
- (c) Hydrogen/propane at 200 K.
- (d) Isooctane/n-octane at 100 °C.
- (e) Water/n-decane at 1 bar.