

1. 40 points

A manuscript has been submitted for publication to a journal. The author claims to have determined the equation of state of a pure solid to be:

$$v = v^0 - aP + bT$$

where: v^0 , a , and b are all constants

Furthermore, the enthalpy of the solid was claimed to be:

$$h = cT - bPT - Pv$$

where: c is also a constant

Are these equations consistent? Based on this claim, would you recommend publication of the article?

2. 60 points

A gas obeys the following equation of state:

$$P(v-b) = RT + aP^2/T$$

a. 30 points

Given that $a = 1.0 \text{ lt-K/atm-mole}$, $b = 0.080 \text{ lt/mole}$, and $C_p = 8 \text{ cal/mole-K}$ at 1 atm pressure (assume it is constant with temperature), find ΔS when the gas changes state from $P_1 = 4 \text{ atm}$, $T_1 = 300\text{K}$ to $P_2 = 12 \text{ atm}$, $T_2 = 400\text{K}$.

b. 30 points

Find an expression for the fugacity coefficient of component 1 in a binary mixture of 1 & 2 assuming the mixture obeys the equation of state given above. Make an appropriate assumption for the mixing rule.