

MT 202 Metallurgical Thermodynamics

Fall 2006

Home Assignment 2

1. Lupis: 1.13
2. Lupis: 1.14
3. Lupis: 1.17
4. Lupis: 1.18
5. Lupis: 1.20
6. Lupis: 1.21
7. Callen: 9.3-2

A long vertical column is closed at the bottom and open at the top; it is partially filled with a particular liquid, and cooled to 268 K. At this temperature, the fluid solidifies below a particular level, remaining liquid above this level. If the temperature is further lowered to 267.8 K, the solid-liquid interface moves upward by 0.4 m. The latent heat (per unit mass) is 2 calories per gram, and the density of the liquid phase is 1 g cm^{-3} . Find the density of the solid phase. Neglect thermal expansion of all the materials. [Hint: Note that the pressure at the original position of the interface remains constant].

8. Lupis: 2.4
9. Lupis: 2.6
10. Lupis: 2.7
11. Lupis: 2.11

Some more questions:

1. Lupis: 1.9
2. Lupis: 1.10
3. Lupis: 1.12
4. Lupis: 1.19

5. Derive expressions for ΔE , ΔH , ΔS for a system containing 1 mol of an ideal gas during the following processes: (a) expansion at constant pressure P from V_1 to V_2 , (b) pressure change from P_1 to P_2 at constant volume V , (c) isothermal expansion at a temperature of T from (P_1, V_1) to (P_2, V_2) and (d) adiabatic expansion from (P_1, V_1, T_1) to (P_2, V_2, T_2) .
6. Show that the entropy change is zero for a system containing a certain amount of ideal gas when it is taken through a full cycle in a Carnot's engine.
7. Lupis: 2.5
8. Lupis: 2.8
9. Lupis: 2.9