CHAPTER 2: PROPERTIES OF SUBSTANCES

CHAPTER OUTLINE

1. Homogeneous substance and phases
   a. Definition
   b. Phases

2. Phase-change processes of pure substances
   a. Description
   b. Vapor-liquid-solid phase equilibrium (handout 2.1)
   c. Property diagrams (handout 2.2)

3. Property tables
   a. Saturated liquid/saturated vapor states and saturated liquid-vapor mixtures (handout 2.3, handout 2.4, handout 2.5)
   b. Superheated vapor (handout 2.6)
   c. Compressed liquid (handout 2.7)
   d. Linear interpolation of tabular data (handout 2.8, handout 2.9)

4. Ideal gas equation of state
   a. Ideal gas law
   b. Graphical representation (handout 2.10)
   c. Example (handout 2.11)
   d. Compressibility factor (handout 2.12)

5. Other equations of state
   a. Van der Waals
   b. Beattie-Bridgeman

CHAPTER OBJECTIVES

- Introduce the concept of a pure substance
- Discuss the physics of phase change processes
- Illustrate the $P-v$, $T-v$, and $P-T$ property diagrams and $P-v-T$ surfaces of pure substances
- Demonstrate the procedures for determining thermodynamic properties of pure substances from tables of property data
- Define “ideal gas” and the ideal-gas equation of state
- Apply the ideal-gas equation of state in the solution of typical problems
- Introduce the compressibility factor
- Present some of the best-known equations of state