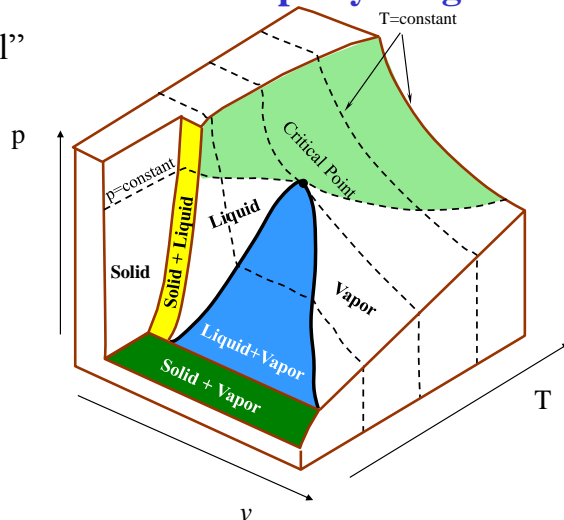


State Equations

- Relationship between TD properties
 - can find one TD properties based on values of some number of other properties
- Example
 - $p(\rho, T)$ or $p(v, T)$ or $T(p, v)$ or ...
 - relation between p, v, T sometimes known as “the” EOS for a substance
 - hard to write “universal” EOS for a substance, e.g., different phases

Equilibrium TD Property Diagram

- “Typical”



Example EOS

- Complex example: Virial EOS

$$\frac{Pv}{RT} = 1 + \frac{B(T)}{v} + \frac{C(T)}{v^2} + \dots$$

– essentially Taylor series expansion in v

- Simple example – Ideal Gas

$$\frac{Pv}{RT} = 1$$

– only good approximation over limited range of conditions

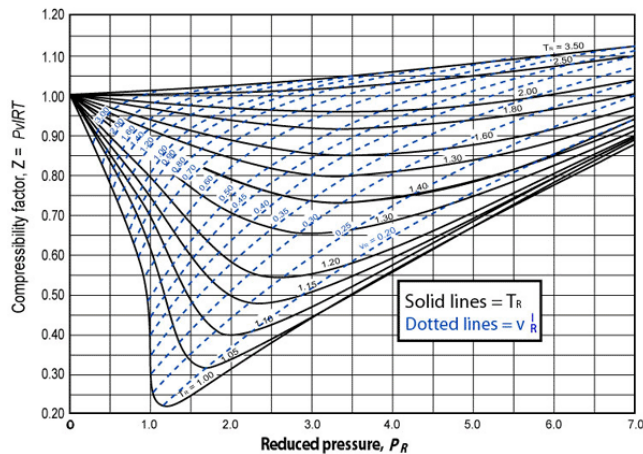
- Others: see for example Appendix H in text

State Equations - 3

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Generalized Compressibility Chart



State Equations - 4

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$$\frac{Pv}{RT} = Z$$

$$T_R = \frac{T}{T_{crit}}$$

$$P_R = \frac{p}{p_{crit}}$$