## Key points of 02/21 lecture

- Equation of state (E-o-S):

  E-o-S constraints the smallest number of observables required to characterize a given "state" or phase of a given substance.

  E.g.: $f(P, T, V) = 0$

  defines a hypersurface in $P, T, V$ space.

  system is in equilibrium only on hypersurface.

- Assembly: Set of thermodynamic parameters on which a system depends.

- If $f = 0$, then

$$df(P, T, V) = \left(\frac{\partial f}{\partial P}\right)_{T,V} dP + \left(\frac{\partial f}{\partial T}\right)_{P,V} dT + \left(\frac{\partial f}{\partial V}\right)_{P,T} dV = 0$$

It follows:

$$\left(\frac{\partial V}{\partial T}\right)_P \left(\frac{\partial T}{\partial P}\right)_V \left(\frac{\partial P}{\partial V}\right)_T = -1$$

$$\left(\frac{\partial T}{\partial P}\right)_V = -\frac{\left(\frac{\partial f}{\partial P}\right)_{V,T}}{\left(\frac{\partial f}{\partial T}\right)_{V,P}}$$