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Course 565/665 Lecturer Prof. Cavagnero

Day 2.24.04 Date 9:55 am

Notes Taken By Jiang Hong Total Number of Pages

Thermodynamic system: collection of particles of interest

open system: can exchange m. V. E with surrounding.

ex: living cell, organism. etc.

closed system: can exchange V. E, but not m with Surr.

isolated system: does not exchange V. E. m with Surr.

adiabatic system: no heat exchange with Surr.

ex: a dewar

isothermal system: T constant

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phase: collection of matter that has the uniform mass, volume (same m/V)?
pressure. {homogeneous}

Simple system: composed by one unique phase.
(cf. Dill book)

Thermodynamic quantities ——

extensive quantities → depend on the size of the system.
V. U. q. S. m

intensive quantities → independent of the size of the system.
T. P. ρ.

$U_{tot} = \sum_{i=1}^{N} U_i$ {for independent particles} $S_{tot} = \sum_{i=1}^{N} S_i$ (N for sub system?) $N \equiv$ # of molecules

$U(N, V, S)$, $S(N, V, U)$

$$du = \left(\frac{\partial u}{\partial s}\right)_{N,V} ds + \left(\frac{\partial u}{\partial V}\right)_{N,S} dV + \sum_{j=1}^{M}\left(\frac{\partial u}{\partial N_j}\right)_{V,S,N_{i\neq j}} dN_j$$

$$ds = \left(\frac{\partial s}{\partial E}\right)_{N,V} dE + \left(\frac{\partial s}{\partial V}\right)_{N,E} dV + \sum_{j=1}^{m}\left(\frac{\partial s}{\partial N_j}\right)_{V,E,N_{i\neq j}} dN_j$$

$$T \equiv \left(\frac{\partial u}{\partial s}\right)_{N,V} \qquad P \equiv -\left(\frac{\partial u}{\partial V}\right)_{N,S} \qquad \mu_j \equiv \left(\frac{\partial u}{\partial N_j}\right)_{V,S,N_{i\neq j}}$$

chemical potential.