

①

$$G = F + PV$$

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

$$dG = dF + PdV + VdP$$

$$= -PdV - SdT + PdV + VdP$$

$$= -SdT + VdP$$

ギブス自由エネルギー変化を独立変数  $S, P$  で表現できた。

$T$ 一定で、 $P$ で偏微分

$\Rightarrow (dT=0)$

$$V = \left(\frac{\partial G}{\partial P}\right)_T$$

$P$ 一定で、 $S$ で偏微分

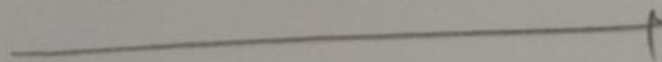
$\Rightarrow (dP=0)$

$$S = -\left(\frac{\partial G}{\partial T}\right)_P$$

$$\left(\frac{\partial S}{\partial P}\right)_T = -\frac{\partial}{\partial P} \left\{ -\left(\frac{\partial G}{\partial T}\right)_P \right\} = -\frac{\partial}{\partial T} \cdot \frac{\partial G}{\partial P} = -\left(\frac{\partial V}{\partial T}\right)_P$$

と、

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



$$\int 1 dx = x + C$$

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