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Sem III, Unit IV

Clausius - Clapeyron equation →

Integrated form of clausius clapeyron equation is

$$\ln(P_2/P_1) = (\Delta H_{vap}/R)\left(1/T_1 - 1/T_2\right)$$

Where P_1 and P_2 are the vapor pressures at temperature T_1 and T_2. T_1 and T_2 are the initial and final temperatures in Kelvin. ΔH_{vap} is the molar enthapy of vaporization (heat of vaporization) R is the universal gas constant (8.314 J/mo.K).

The Clausius- clapeyron equation describes the relationship between a substance's vapor pressure and temperature for a phase transition, typically a liquid-to-gas or solid-to-gas change. It is commonly expressed in its integrated form as "$\ln(P_2/P_1) = (\Delta H_{vap}/R)(1/T_1 - 1/T_2)$. This equation can be used to calculate the vapor pressure at a new temperature if the vapor pressure at an initial temperature is known.

uses ~~of~~ this equation

→ If you know the vapor pressure at one temperature we use this equation to find the pressure at a different temperature

→ By measuring vapor pressure at two different temperatures, By using this equation to calculate the enthalpy of vaporization.

→ The equation provides a link between experimentally measurable quantities like pressure and temperature and fundamental thermodynamic properties like enthalpy.

Limitations of this equation

→ The equation relies on assumption, such as the vapor behaving as an ideal gas and the enthalpy of vaporization being constant, which may not hold true at higher pressure and temperatures.

→ It is less accurate for phase transitions between two solids or liquids, where the more general clapeyron equation should be used.