Chemistry (Hons)

8th Lecture

01
25/04/2020

Joule-Thomson coefficient for ideal gas

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The Joule Thomson coefficient is defined as the variation of temperature with Pressure at Constant enthalpy. The Joule-Thomson coefficient of an ideal gas is zero. In real gas Joule-Thomson coefficient is different from zero depends on pressure and temperature.

The adiabatic (no heat exchanged) expansion of a gas may be carried out in a no. of ways. The change in temperature experienced by the gas during expansion depends not only on initial and final pressure but also on the manner in which the expansion is carried out. If the expansion process is reversible then the gas is in thermodynamic equilibrium all the time and called an isentropic expansion. In this case gas does positive work.

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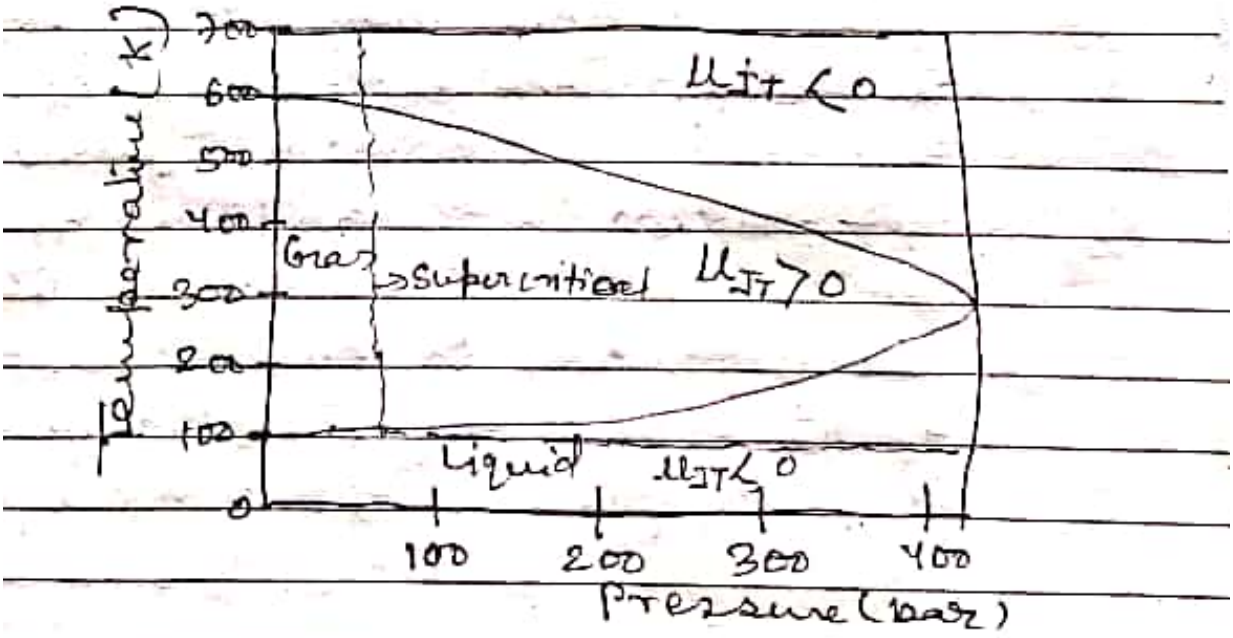
and its temperature decreases
In a free expansion the gas does no work and absorbs no heat so internal energy is conserved. Expanded in this manner, the temperature of an ideal gas will remain constant but the temp. of the real gas decreases except at very high temperature.

The method of expansion discussed in which a gas or liquid at pressure P_1 flows into a region of lower pressure P_2 without significant change in kinetic energy is called the Joule-Thomson expansion.



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At temperatures below the gas liquid coexistance curve N_2 condenses to form a liquid and μ coefficient again becomes negative. Thus for N_2 gas below 621 K, a Joule-Thomson expansion can be used to cool the gas until liquid N_2 forms

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