

(a) Andrews' Experiment on Carbon Dioxide

Andrews' experiment investigated the behavior of CO_2 and analyze the pressure (P) versus volume (V) at different temperature T .

The observations are following:

1. Above a temperature of about ($T = 48^\circ C$), the CO_2 resembles that of Ideal gas.
2. As temperature is lowered, the isotherms exhibit distortion which gradually increases, which is indication of deviation from the ideal gas character.
3. At $31.4^\circ C$ a Kink is observed which suggests that gas can be liquified under compression.
4. As temperature is lowered further, the kink spreads into a horizontal line, i.e., compression produces liquification.

From A to B , CO_2 behaves as a gas. At point B , the liquification of the gas just starts. The gas condenses at constant pressure from B to C , so that liquid and vapour phase co-exist. At C , the gas is completely in the liquid phase. From C to D , the slope is very steep since a liquid is almost incompressible.

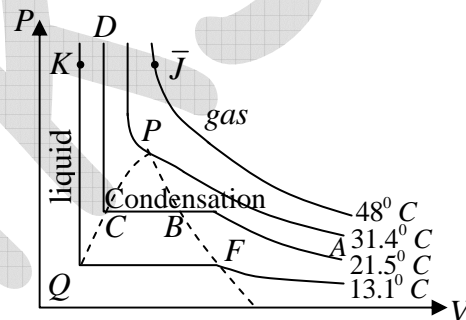


Figure 1

Conclusion: The temperature at which it becomes possible to liquify a gas under compression is known as critical temperature (T_c) [In Andrews' experiment (T_c) = $48^\circ C$], corresponding pressure and volume is known as critical pressure (P_c) and critical volume (V_c).

A gas can be liquified only if it is cooled upto or below its characteristic critical temperature.

There exist a continuity of liquid and gaseous states, i.e. they are two distinct stages of a continuous physical phenomenon.