* Freundlich Adsorption Isotherm :-

The quantity of the gas adsorbed by a given mass of the adsorbent depends upon temperature and pressure. It has been found that adsorption of a gas on a solid surface increases with the increase with the increase in pressure at constant temperature. But the increase in adsorption is not directly proportional to the pressure applied.

Freundlich gave the following relation known as Freundlich adsorption isotherm —

$$\frac{x}{m} = kp^{1/n} \quad \text{——— (1) (at Constant Temperature)}$$

Where, x = mass of the gas adsorbed

m = mass of the solid adsorbent.

$\frac{x}{m}$ = Extent of adsorption

p : Pressure of the gas.

k & n are constant at a particular temperature and for a particular adsorbent and a gas.

Taking log on both sides in eqn – (1) we get.

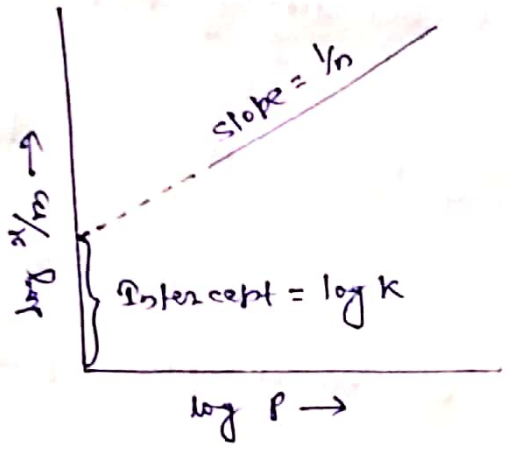
$$\log \frac{x}{m} = \frac{1}{n} \log p + \log k \quad \text{——— (2)}$$

Equation –(2) is similar to the straight line equation –

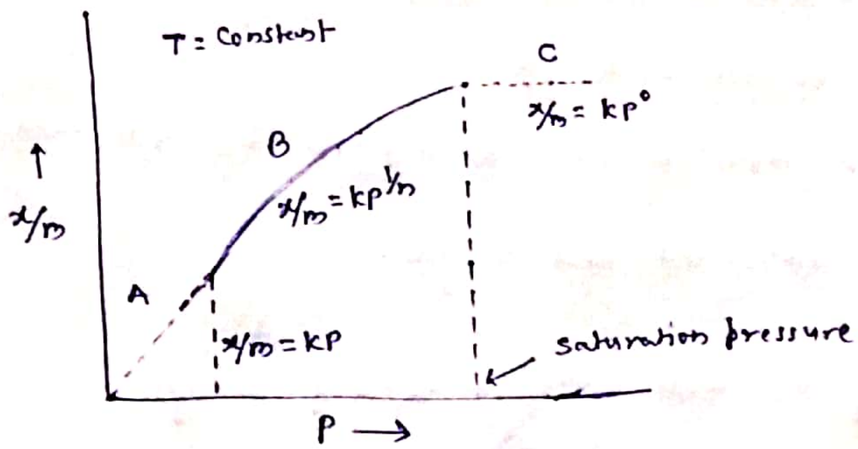
$$y = mx + c.$$

A plot of $\log \frac{x}{m}$ Vs $\log P$ will be a straight line. The slope of the line is equal to $1/n$ and intercept on the Y axis is equal to $\log K$.

The curve obtained by plotting x/m Vs P at constant Temperature are called Adsorption Isotherm.



The term isotherm is used when temperature is constant. The curve may be divided in to three parts viz. A, B & C.



PART – A

Here Pressure is low. the curve is almost straight line. Hence at low Pressure.

$$\frac{x}{m} \propto P \quad \text{or} \quad \frac{x}{m} = KP$$

PART – C

Here pressure is high. It is a straight line parallel to the pressure axis. This show that x/m doesnot depend upon pressure. i.e

$$\frac{x}{m} = kp^{0} \quad \text{or} \quad \frac{x}{m} = k = \text{Constant.}$$

PART – B

Here pressure is in intermediate.

$$\frac{x}{m} \propto p^{1/n} \quad \text{or} \quad \frac{x}{m} = kp^{1/n}$$

The factor $1/n$ can have values between 0 & 1.

(i) When $\frac{1}{n} = 0$

$$\frac{x}{m} = K \text{ (constant)}$$

(ii) When $\frac{1}{n} = 1$

$$\frac{x}{m} = kP$$

$$\text{or} \quad \frac{x}{m} \propto P.$$

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