

Lecture 3  
Surface Dynamics



Irving Langmuir 1881–1957

Concepts of adsorption, desorption, various kinds of adsorption, energetics of adsorption, adsorption isotherms



Assumptions

1. Adsorption does not occur beyond monolayer
2. Sites are equivalent and surface is uniform
3. Adsorption at one site is independent of occupancy at another site

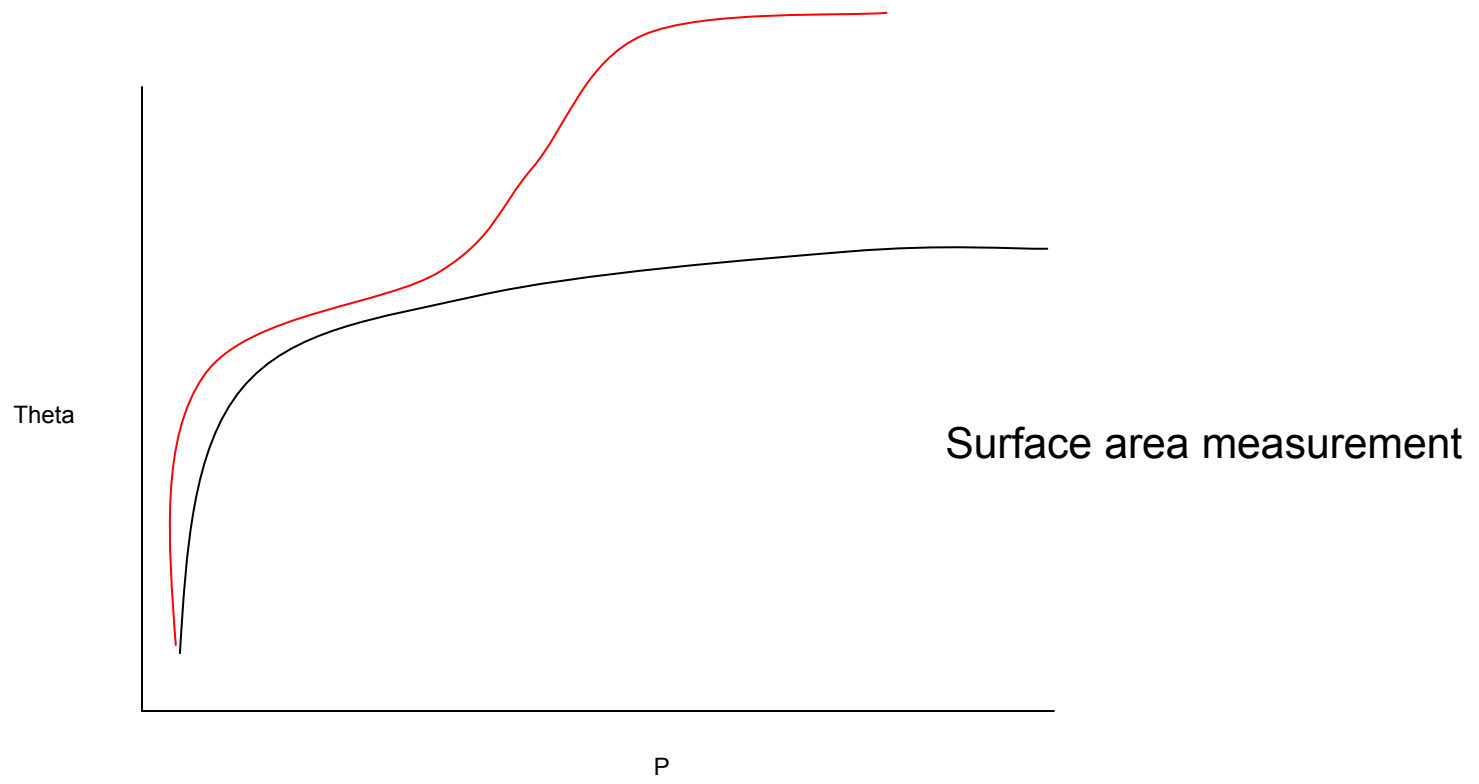
Adsorption,

$$d\Theta/dt = k_a PN(1 - \Theta)$$

Desorption,

$$d\Theta/dt = -k_d N\Theta$$

$$P = \frac{\Theta}{K(1 - \Theta)} \quad \text{or} \quad \Theta = \frac{KP}{1 + KP}$$



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## Dissociative Adsorption

$$r\Theta^2 = k(1 - \Theta)^2 P$$

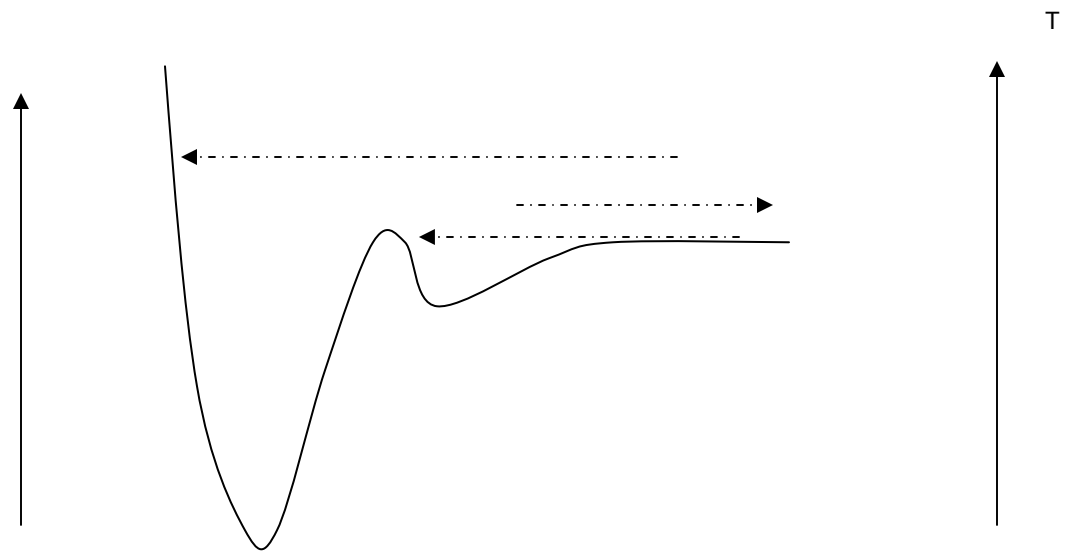
$$\frac{\Theta}{1 - \Theta} = \frac{k^{1/2} P^{1/2}}{r^{1/2}}$$

$$\Theta = \frac{KP^{1/2}}{1 + KP^{1/2}}$$

$$K = (k/r)^{1/2}$$

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# Adsorption and reaction



Adsorbed state