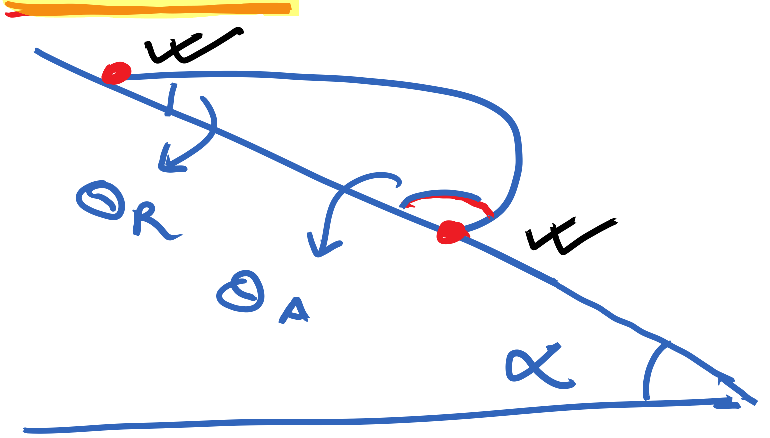
PINNING

27.01.2022

Lecture-08



$\alpha < \alpha_c$

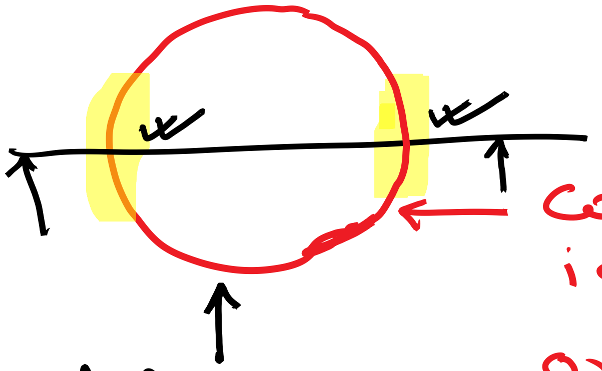
Drop is still stuck.

$CAH = |\theta_A - \theta_R|$

$\alpha = \alpha_c$

But there is a net force acting on the drop →

Force Imbalence → But the drop does not move



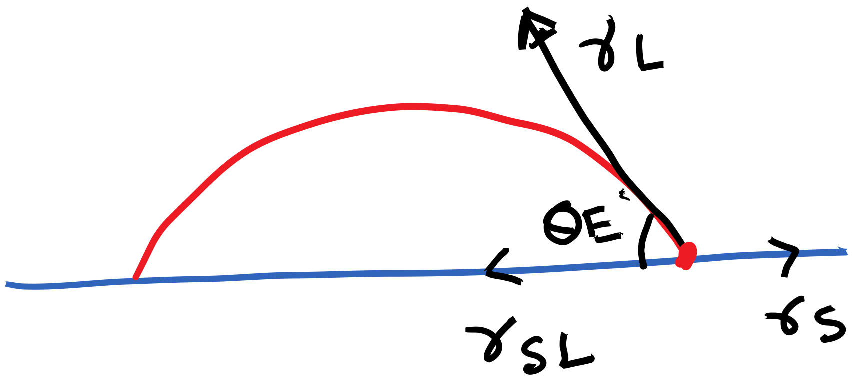
Contact Line is STUCK or PINNED.

θ along Contact Line at Each Location.

Despite having a net non zero force if Contact line does not move →

This is Called PINNING of the Contact Line.

Young's Equation



$$\gamma_S = \gamma_{SL} + \gamma_L \cos\theta_E$$

Pinning is a combination property → Pair of Solid and Liquid

Along a Pinned Contact Line

→ There is local adhesion (additional) adhesion → which prevents the immidiate movement of the drop.

Keep on increasing α →

At $\alpha = \alpha_c$ → drop starts to move.

Strength of Pinning:

Higher is α_c, Higher is the Strength of Pinning.

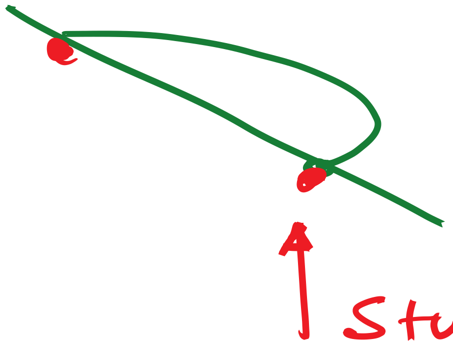
* What is the role of α on drop movement?

→ Higher is the value of α_c, Higher is the strength of pinning.

→ What is the role of α on drop movement.

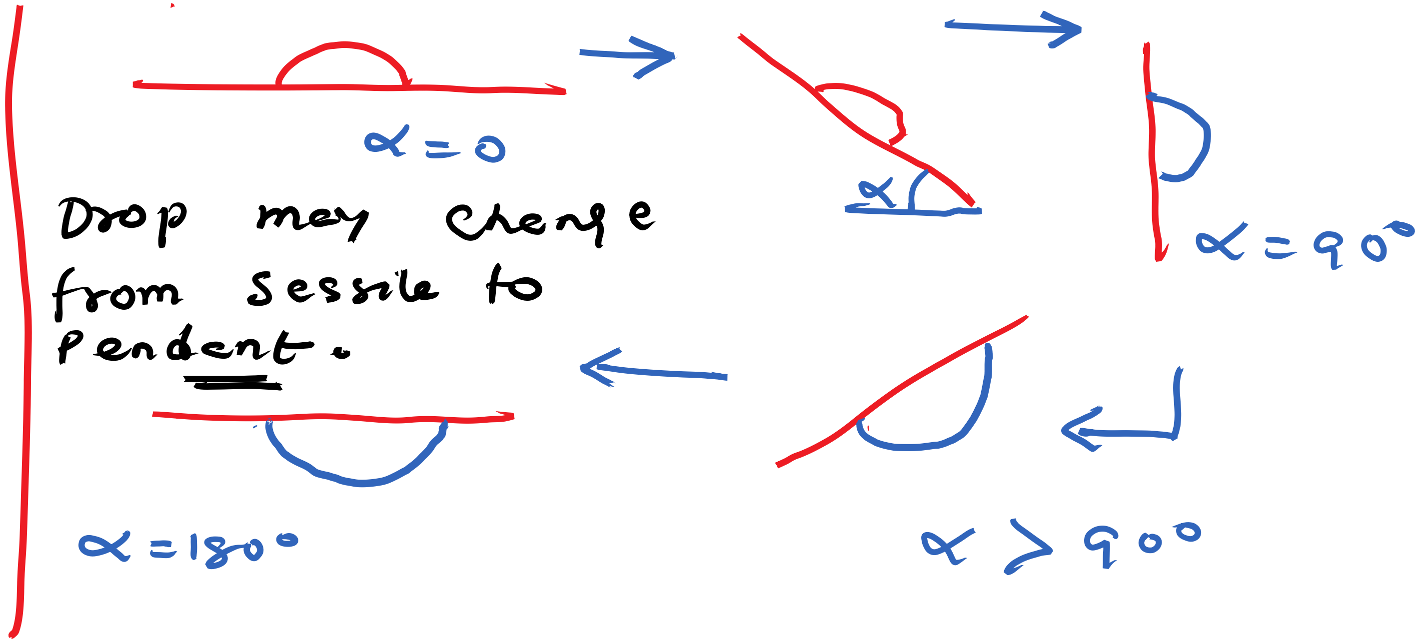
↳ $-g \sin\alpha$ → Body force is acting on the drop.

over a sticky surface.



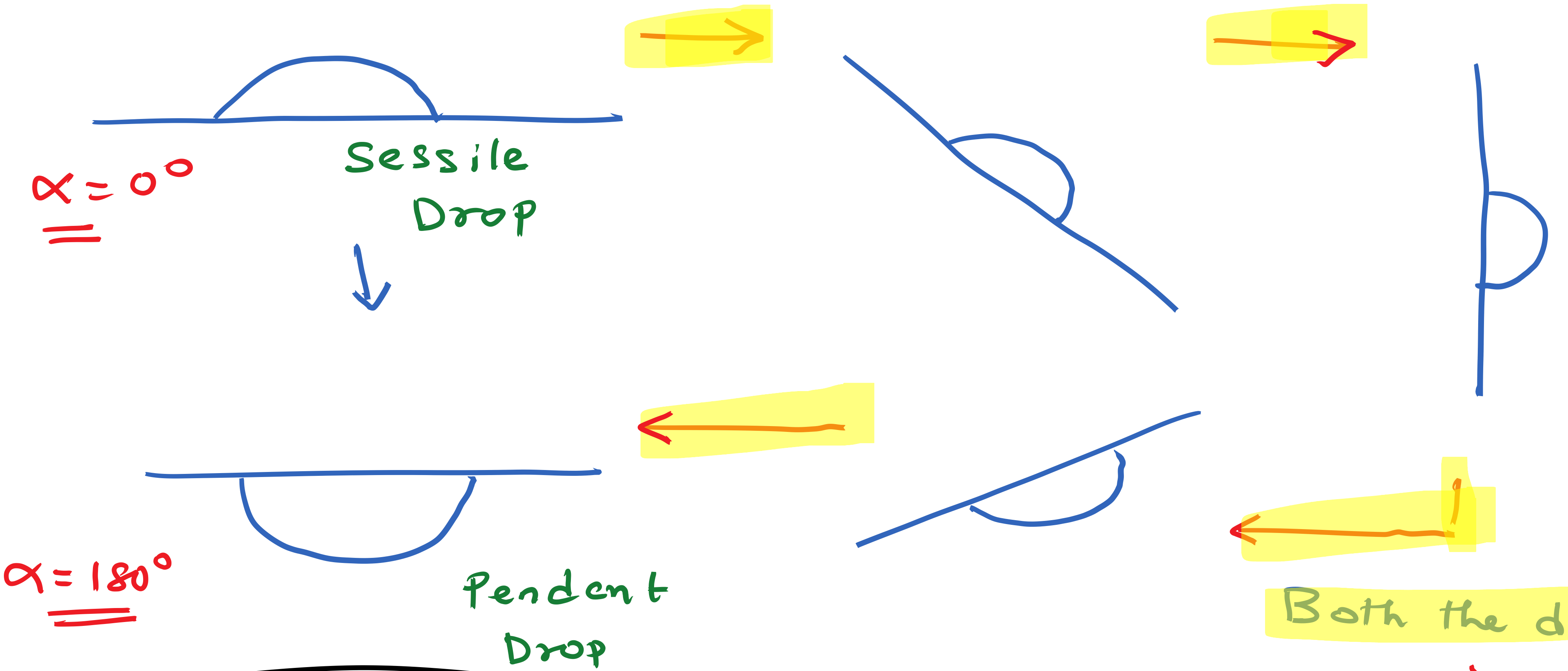
Stuck

Some local force of adhesion.



Drop may change from sessile to pendent.

α increases all the way to 180°.

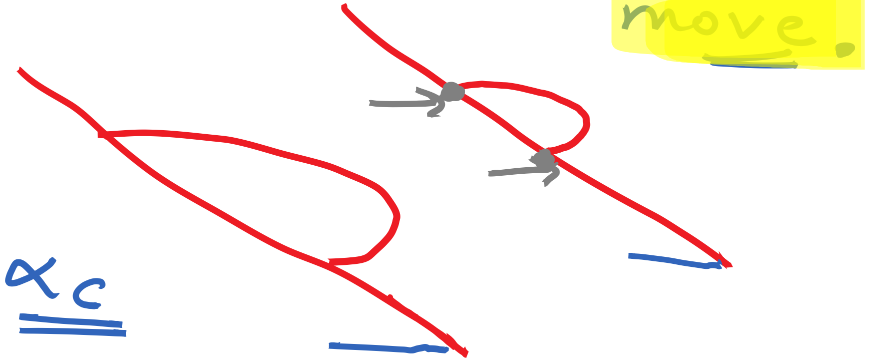


Both the drops should move.

For some Specific Material →

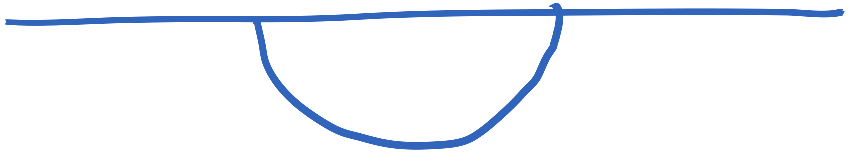
If the Strength of the Pinning is extremely (!) High [Infinite Pinning]

Then the drop won't move.

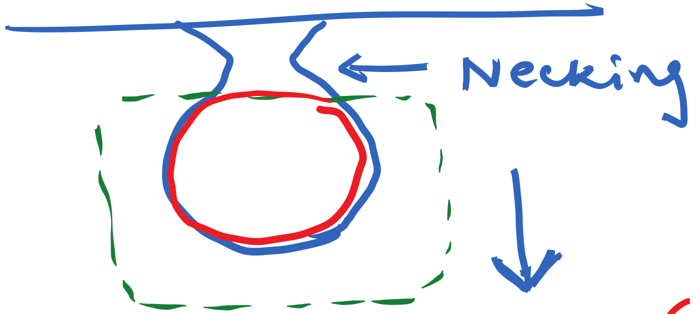


α_c

Lower



→



Detach (gravity)

Rose Petel

$\theta_E \approx 150^\circ$

CAH → ∞

NOT SUPERHYDROPHOBIC

This is also possible

→ Remains attached coz of adhesion.

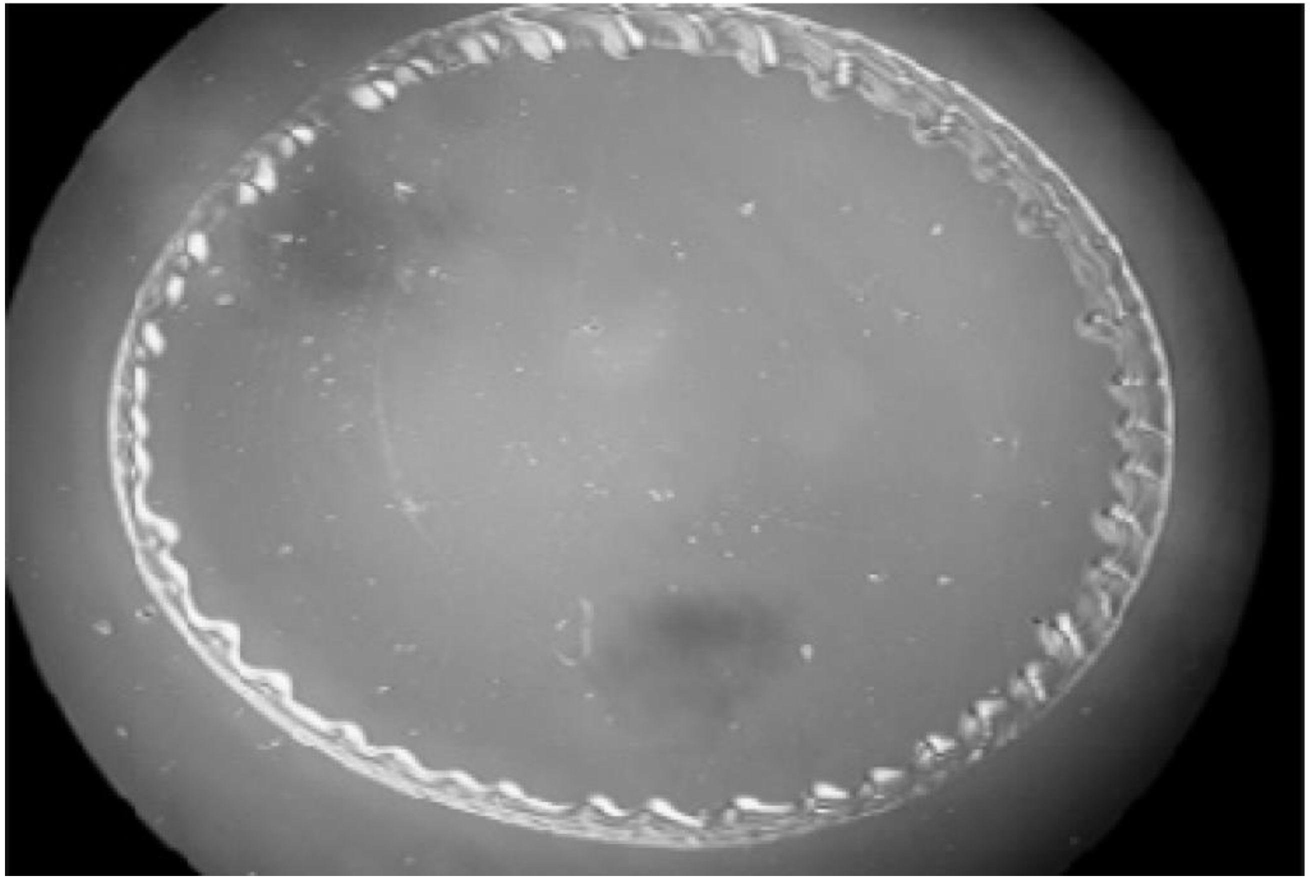
Such Surfaces are Called Sticky Surfaces. → Sticky Hydrophobic surface

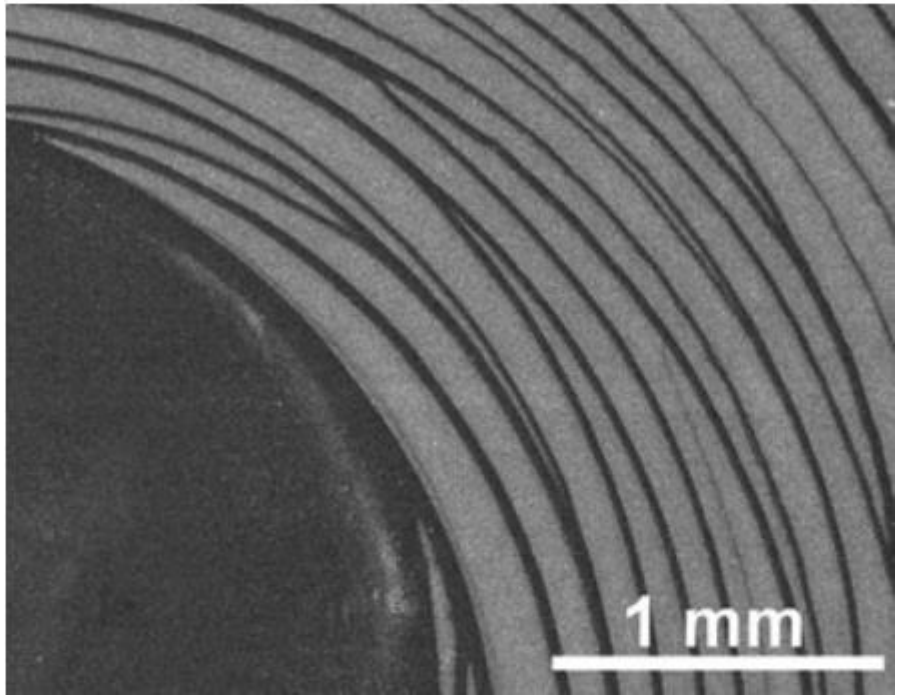
Example: Rose Petal

Hydrophobic Surfaces: → $\theta_E > 90^\circ$ (Liquid is water).

Super Hydrophobic Surface: →
i) $\theta_E > 150^\circ$
ii) CAH $< 10^\circ$

Simultaneously satisfied to Qualify as sup Hyd.

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