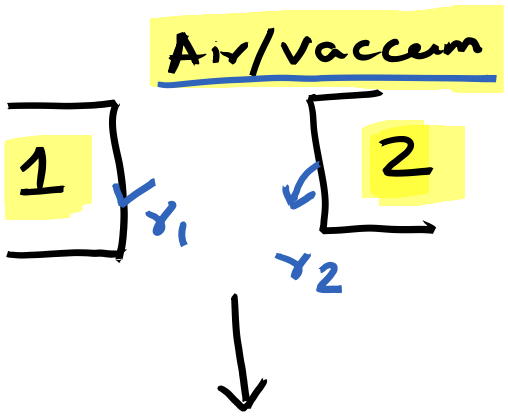
10.02.2022

Lecture-14

Surface Tension :-



$$\Delta G_{12} = G_F - G_i$$

$$= \gamma_{12} - (\gamma_1 + \gamma_2)$$

$\Delta G > 0$ Not Favored.

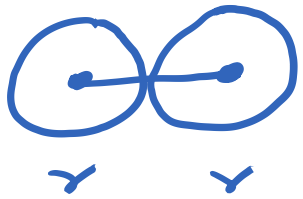
$\Delta G < 0$ Thermodynamically favored.

That the block of 1 and block of 2 will adhere.

d_o

One school of thought

→ min. sepn. distance between two surfaces to contact is d_o.



Surface Tension is always +ve

γ_1 = +ve

$\Delta G_{11} = -2\gamma_1$

ΔG_{11} = - ve

Adhesion of similar objects is favored in Air or vaccum.

$\Delta G_1 = \gamma_{11} - (\gamma_1 + \gamma_1)$

$= \gamma_{11} - 2\gamma_1$ ⇒

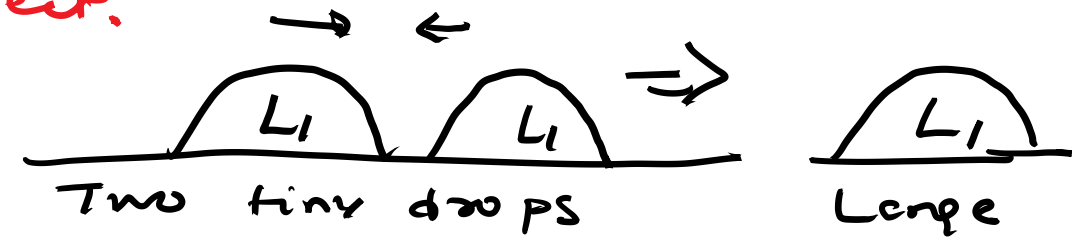
Assumption :- $\gamma_{11} = 0$

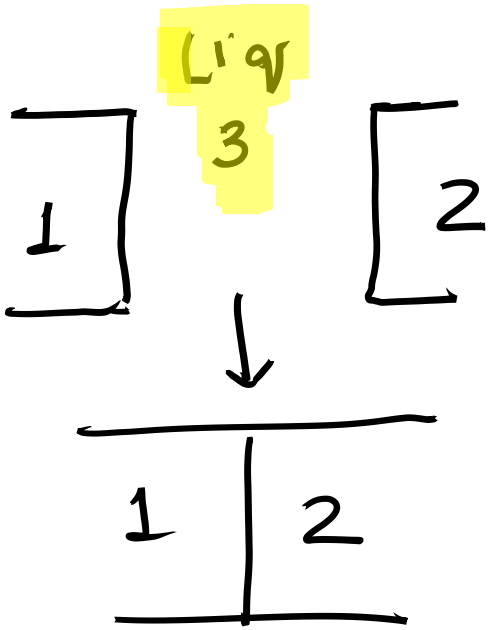
1 1

1 1

1-1 → Interface between 1 and 1

Assumption/ Implication: As if the interface between the two original blocks of 1 are not distinguishable → and It behaves like a single large object.





ΔG_{12} ←

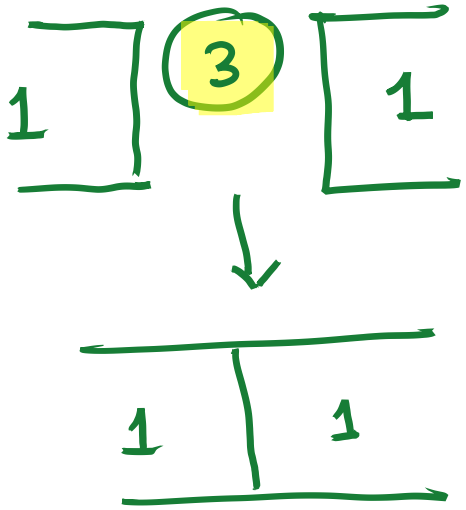
$\Delta G_{132} = \frac{+ve}{-ve}$

↓

The two objects will come in contact in a liquid 3.

$$\Delta G_{132} = \gamma_{12} - (\gamma_{13} + \gamma_{23})$$

3 is always a liquid



$$\Delta G_{131} = \gamma_{11} - (\gamma_{13} + \gamma_{13})$$

$$\Delta G_{131} = -2\gamma_{13}$$

γ_{13} Can be -ve or +ve

Med. Bottle

↳ Colloidal or dispersion Stability

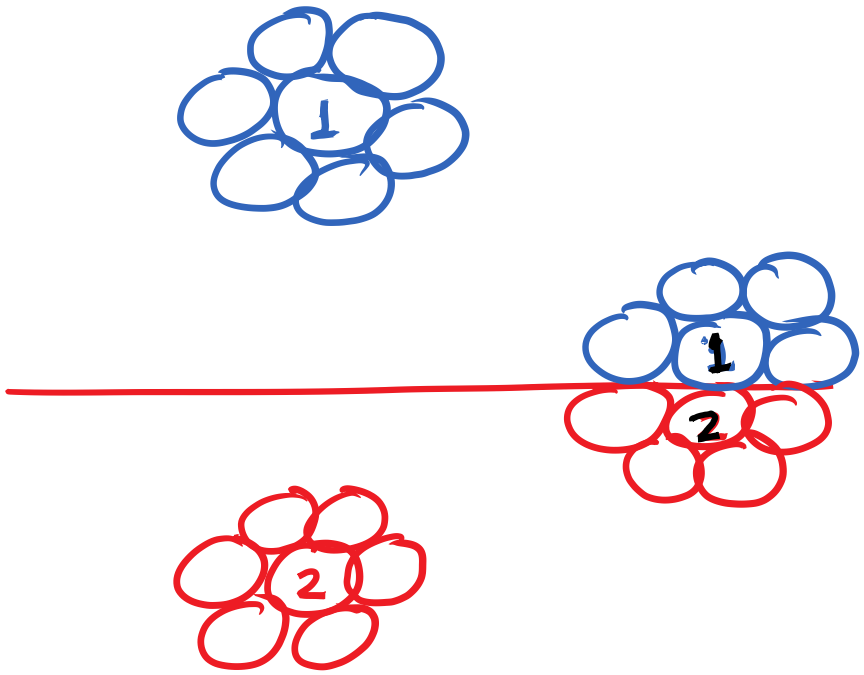
$\gamma_{13} = -ve$

Cond- for Stable Colloid

Components of Surface Tension:-

Difference in the total Energy of interaction of 1 molecule of (1) and 1 molecule of (2), when they were in bulk vs. when they are at the interface.

1

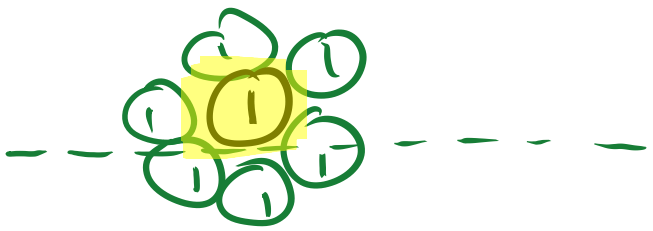


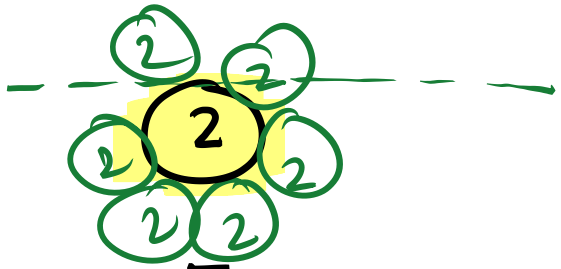
P_{12} = (Energy of interaction of a pair of molecule at surface)

− (Energy of Interaction of the same pair when in Bulk)

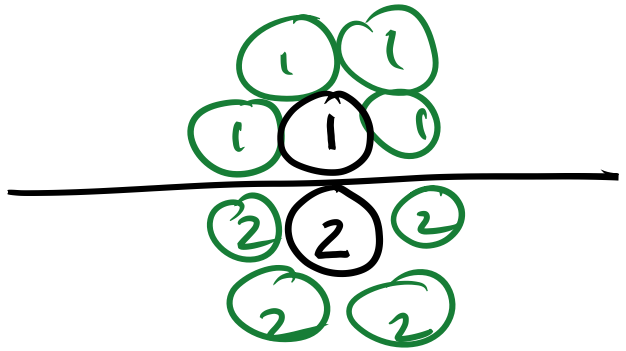
$$P_{12} = E_s - E_b$$

2





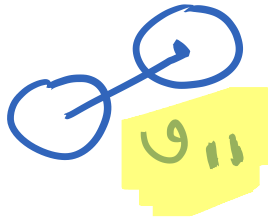
E_B



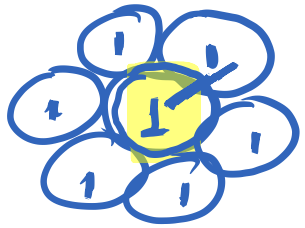
E_S

$$P_{12} = E_S - E_B$$

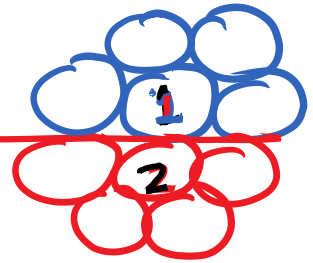
Components of Surface Tension:- $\vartheta_{11}, \vartheta_{22}, \vartheta_{12}$



1



ϑ_{12}



Total intermolecular Interaction that's held mol of 2 is subject to is $(\vartheta_{22} z_{22})$

2

z_{11} = Co-ordination No. in Phase 1

z_{22} = Co-ordination No in Phase 2.

ϑ_{11} = Pair wise interaction Potential between two molecule of 1

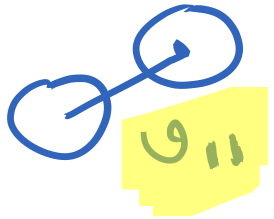
(vdW, may include Polar Int, Steric interaction)

$$\vartheta_{11} = \vartheta_{11}^{LW} + \vartheta_{11}^{AB} + \vartheta_{11}^{ST} + \cdots$$

- ϑ_{11}^{LW} : Van der waal — Present Always.
- ϑ_{11}^{AB} : Polar — Acid-Base Int
- ϑ_{11}^{ST} : Steric Int (Polymer)

Components of Surface Tension:-

$\vartheta_{11}, \vartheta_{22}, \vartheta_{12}$



1

Z_{11} = Co--ordination No. in Phase 1

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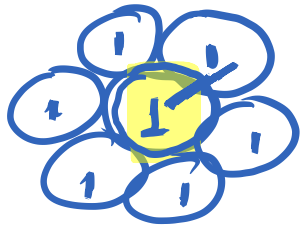

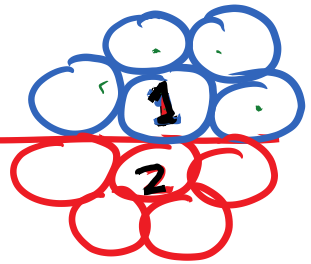

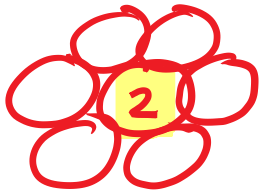

ϑ_{22} , $\vartheta_{12} = \vartheta_{21}$

Z_{11s}, Z_{22s}, Z_{12}, Z_{21}

$$\rightarrow E_b = Z_{11}\vartheta_{11} + Z_{22}\vartheta_{22}$$

$$P_{12} = E_s - E_b$$

2

$$E_s = Z_{11s}\vartheta_{11} + Z_{12}\vartheta_{12} + Z_{22s}\vartheta_{22} + Z_{21}\vartheta_{21}$$