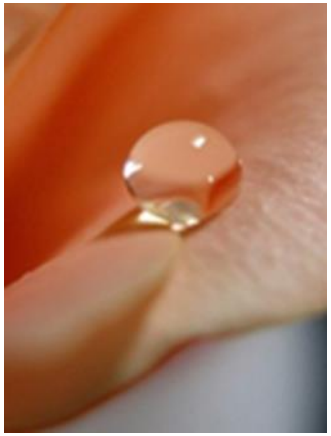
UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

Dipartimento di Scienze Fisiche, Informatiche e Matematiche

NANO LAB



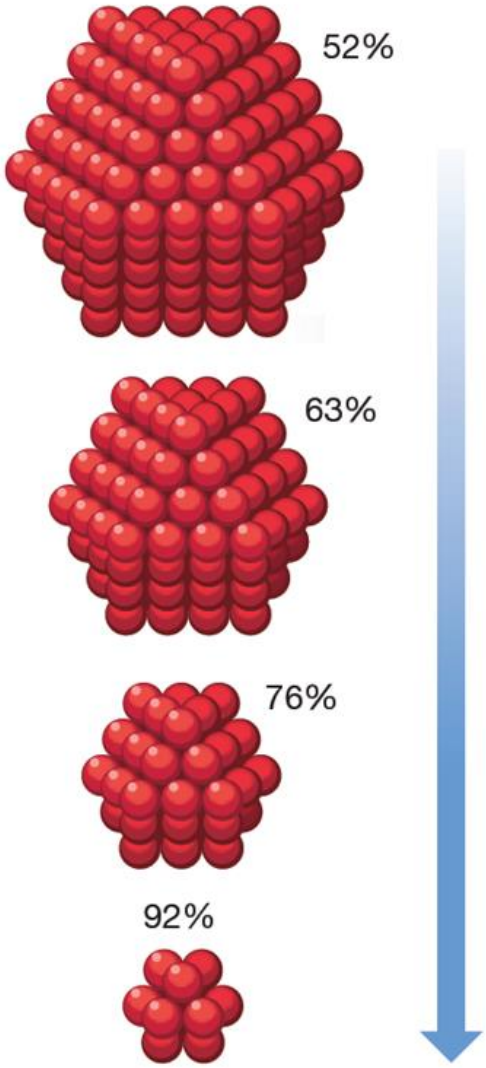
Superfici Superidrofobiche

Nanolab UniMoRe

Effetti di superficie

Il **rapporto esaltato superficie /volume** rende **dominanti** le **forze elettromagnetiche** ed intermolecolari rispetto alla gravità**.**

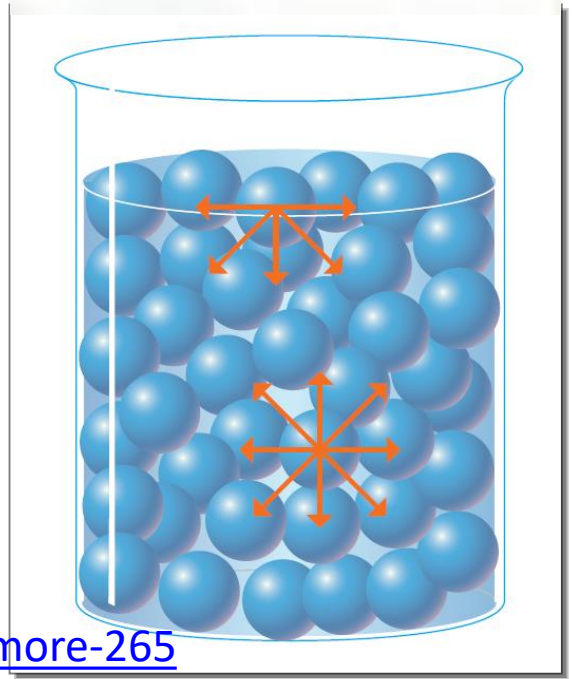
Un esempio:
L'acqua sul pavimento vi fa scivolare ma tra due lastre di vetro ….



Tensione superficiale

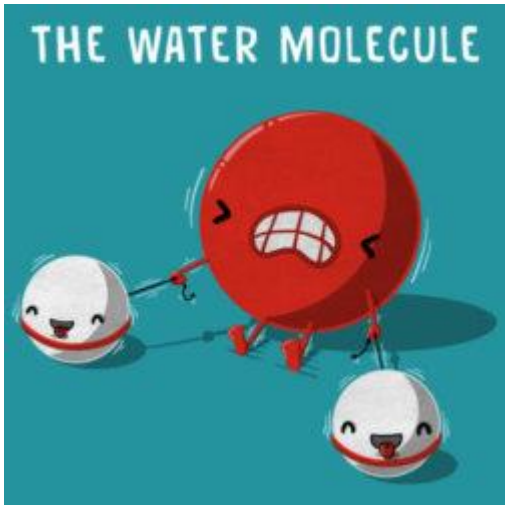
La **tensione superficiale** fa sì che l'acqua si comporti come una pellicola, e che le gocce d'acqua siano sferiche (minima **area superficiale**)

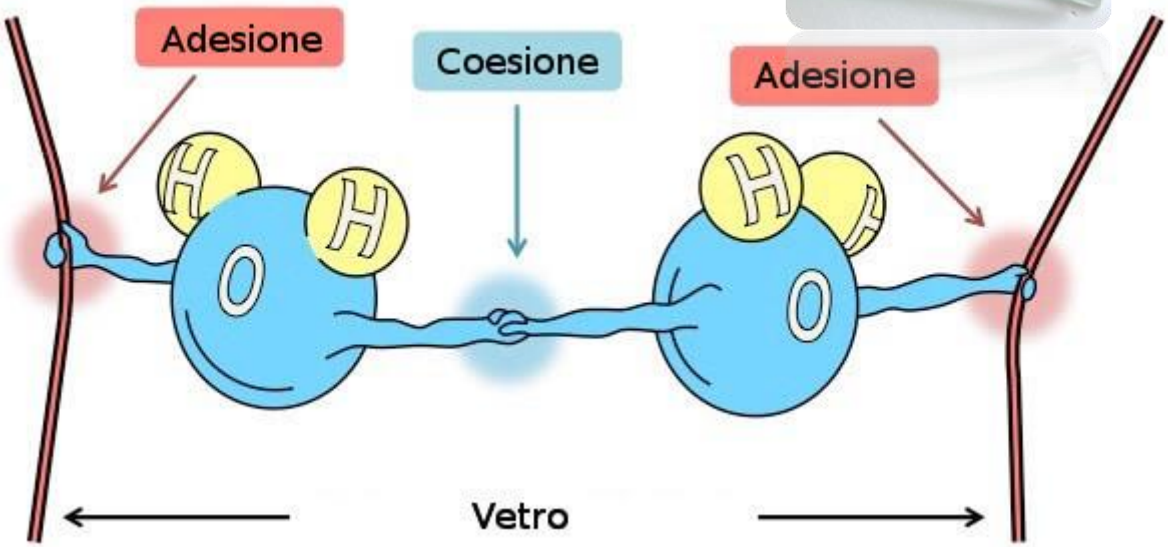
Le **forze attrattive** sulle molecole di superficie **non sono totalmente bilanciate**

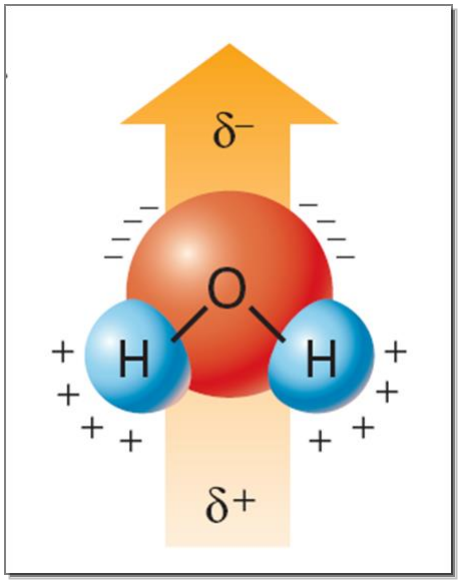


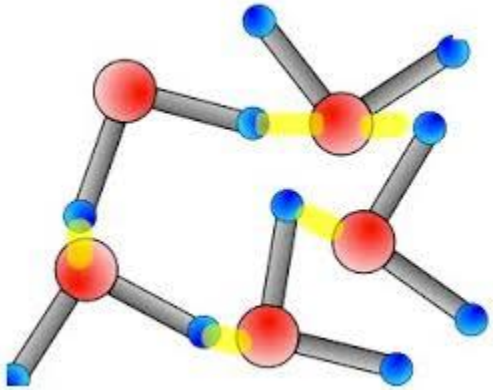
https://www.ilpiacerediscoprire.it/la-scommessa-impossibile/#more-265

Legami fra atomi e molecole



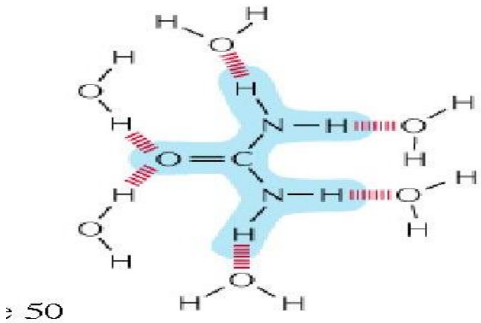






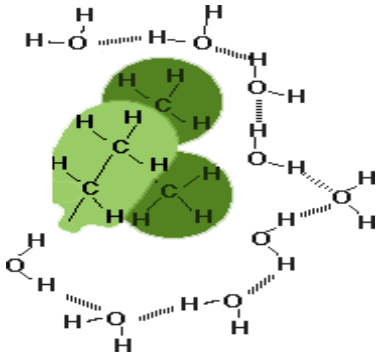
Idrofilico/idrofobico

Interazione idrofilica



molecole in grado di formare **legami idrogeno**

Interazione idrofobica

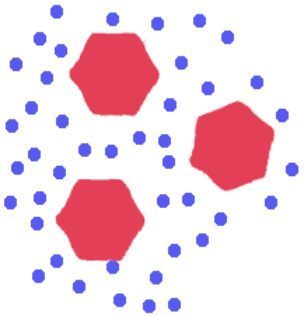


molecole che **non formano** legami idrogeno.

Solubili in acqua

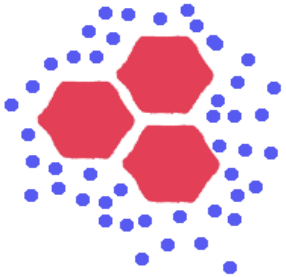
massima area di contatto con

l'acqua

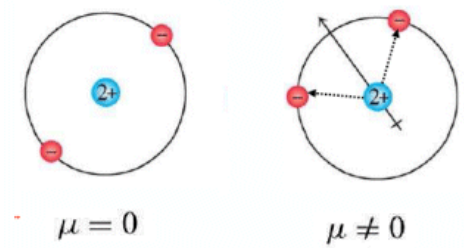


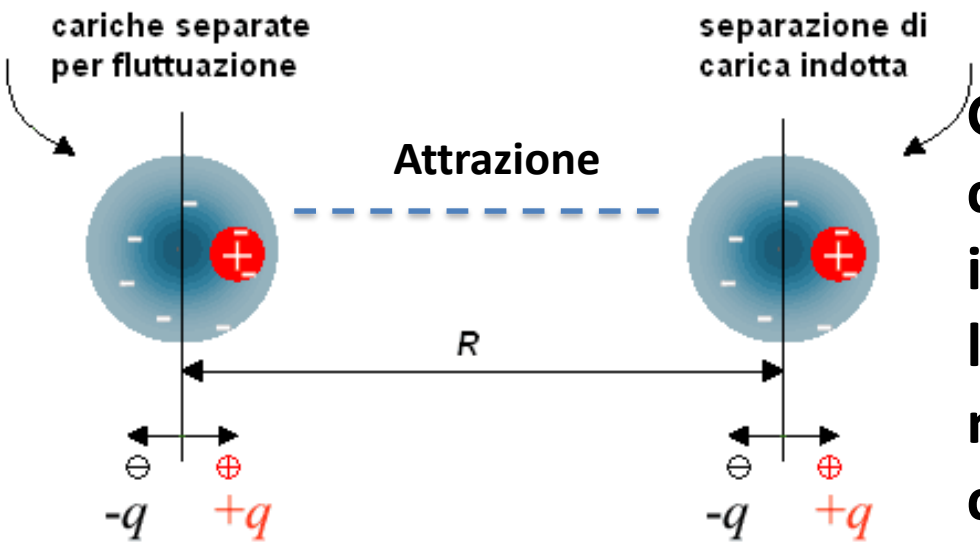
Insolubili in acqua

minima area di contatto con l'acqua

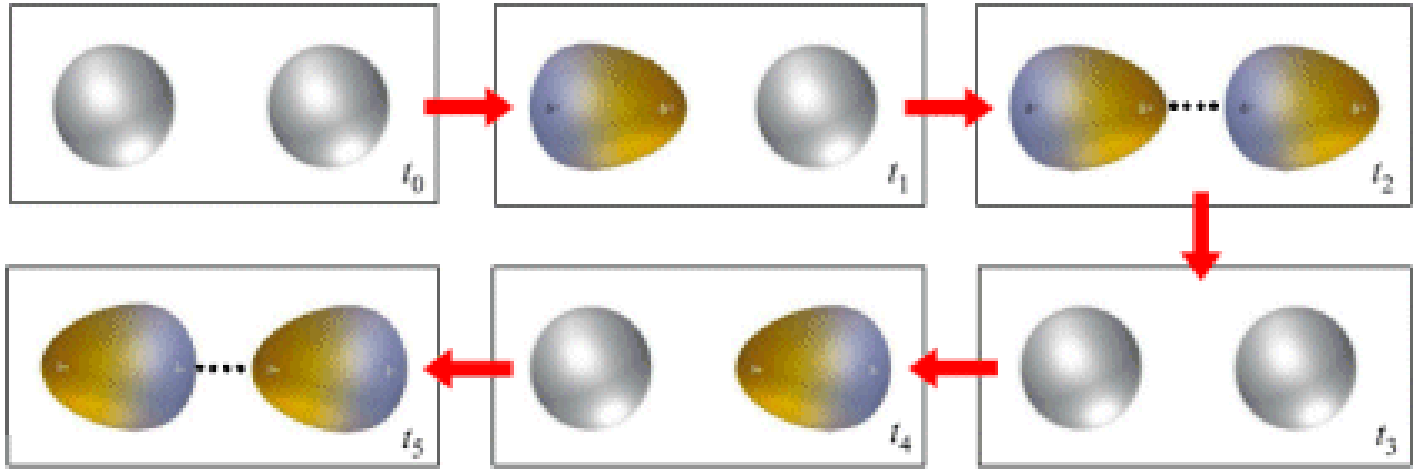


Le forze di Van der Waals



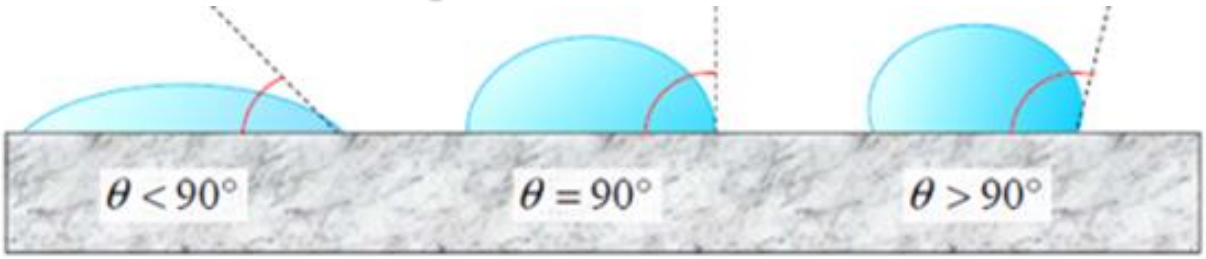


Gli elettroni muovendosi creano piccolissimi dipoli istantanei che inducono a loro volta dipoli istantanei su molecole vicine. Le zone con carica opposta si attraggono.



Se faccio la media temporale del dipolo ottengo 0

Bagnabilità di una superficie



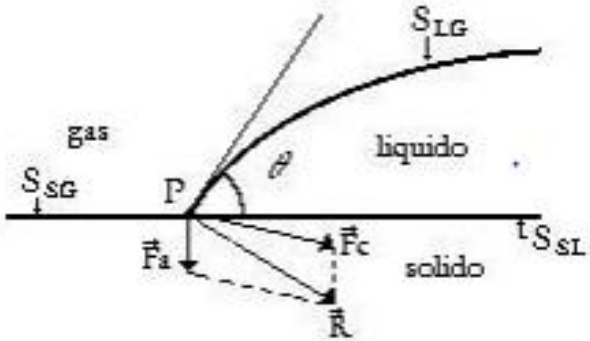
L'angolo di contatto:
Misura macroscopica della **bagnabilità**

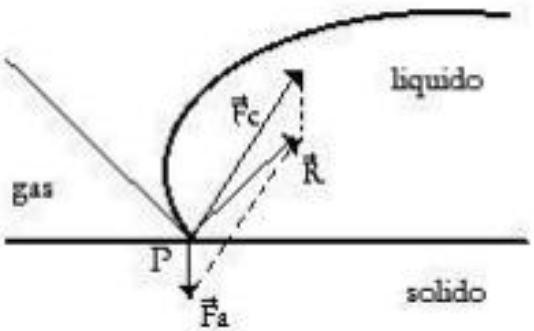
La bagnabilità dipende dalla:

- chimica solido-liquido
- topologia della superficie

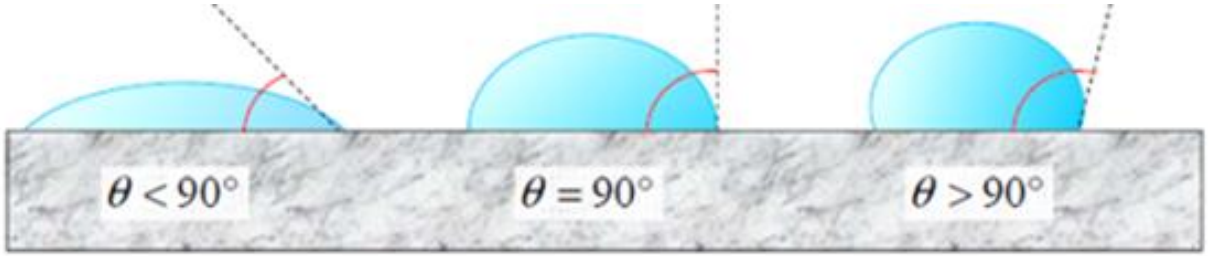
Angolo di contatto	Tipologia superficie
0°	superidrofila
<30°	idrofila
30-90°	intermedia
90-140°	idrofoba
>140°	superidrofoba

Angolo di contatto

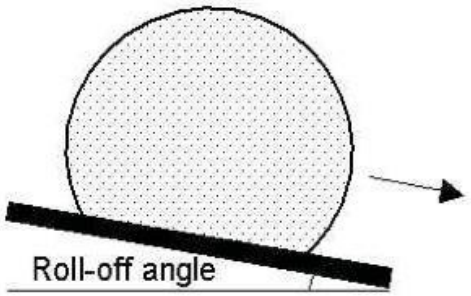




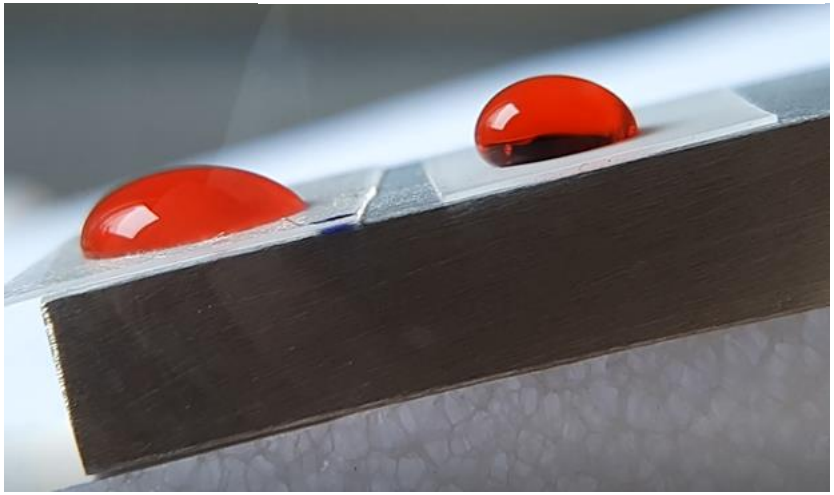
L'ampiezza dell'angolo di contatto dipende dal bilanciamento tra le forze di adesione e di coesione.

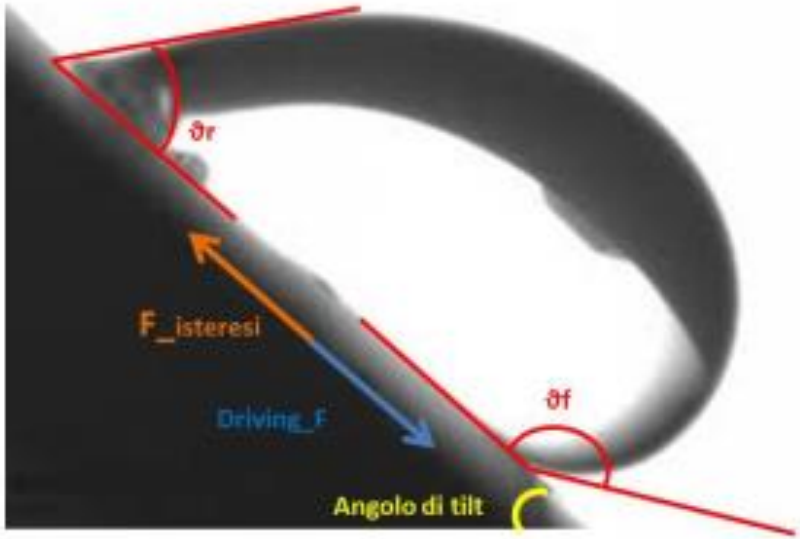


Angolo di rotolamento



Angolo di tilt (o roll off angle) è il minimo angolo a cui deve essere inclinata una superficie perché la goccia si metta in moto





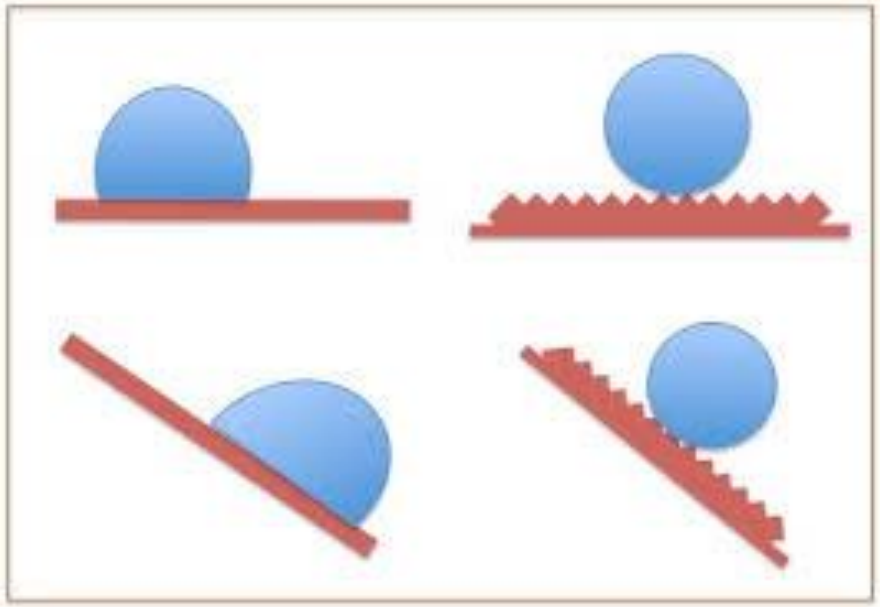
Angolo di contatto

- avanzante ϑf
- retrocedente ϑr

forze di adesione e motrice

Superfici e autopulizia

Si parla di superfici superidrofobiche quando l'angolo di contatto statico è attorno ai 150° e l'angolo di tilt <10°.

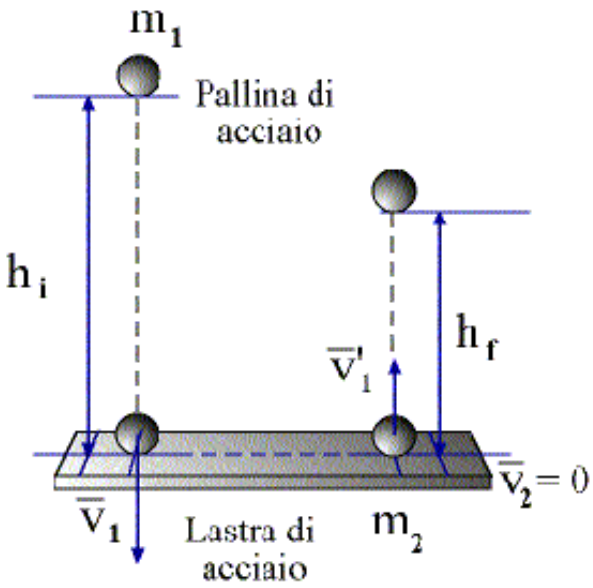


Superfici superidrofobiche: nanostruttura e autopulizia

Superfici superidrofiliche: autopulizia per fotocatalisi

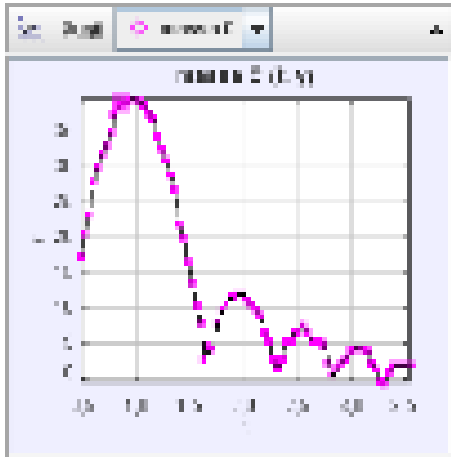
Coefficiente di restituzione

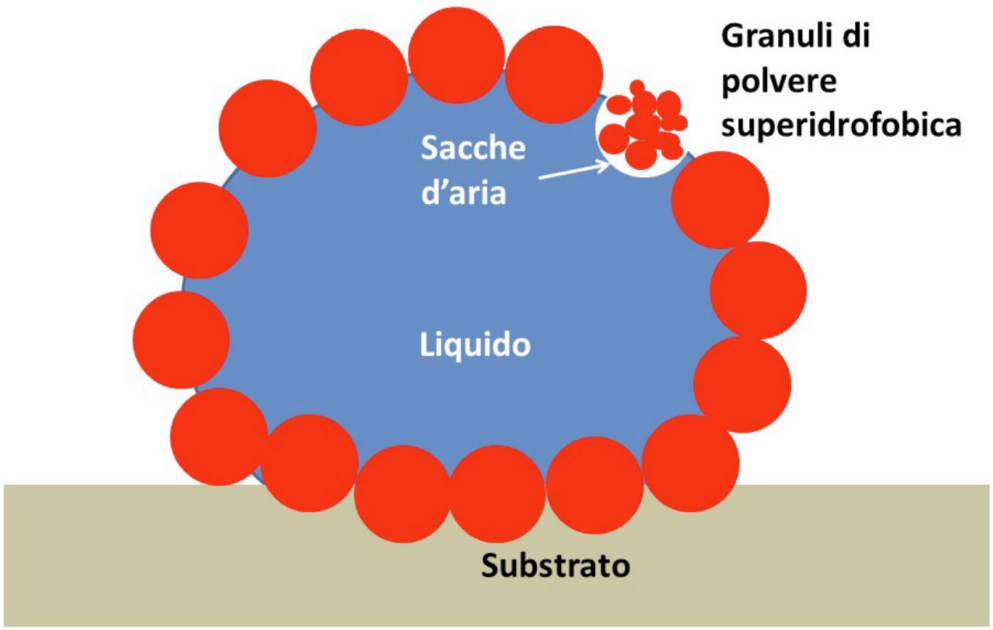
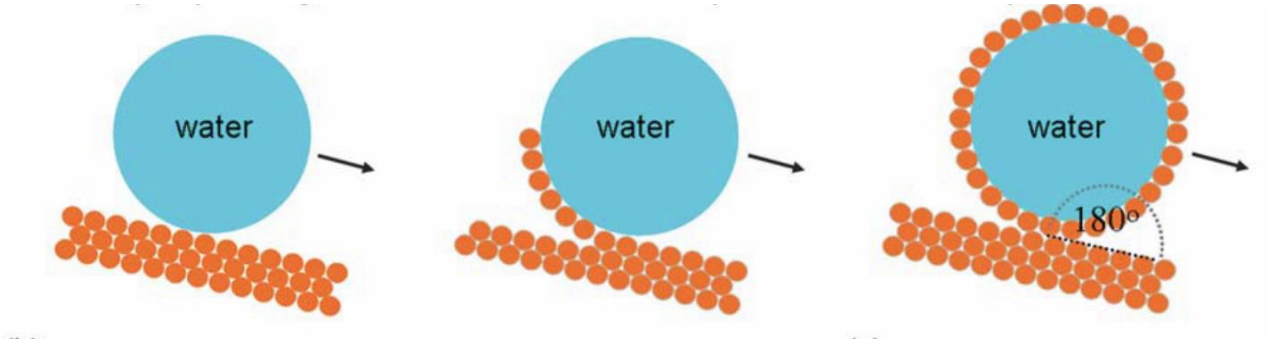
MichaelMaggs Edit by Richard Bartz



$$\frac{v_1{}'}{v_1} = e$$

http://www.science.unitn.it/~fisica1/fisica1/appunti/mecc/appunti/cinematica/urti/node9.html



Biglie liquide

Una goccia di acqua rotola su un letto di grani idrofobici che le si attaccano per effetto dell'incapsulamento in sacche di aria