

# STATO SOLIDO

-FORMA PROPRIA E VOLUME PROPRIO

-ORDINE A CORTO E A LUNGO RAGGIO

-RIPETIZIONE IN 3D DI UNA STESSA UNITA'

→ CELLA ELEMENTARE

↓ STRUTTURA PERIODICA → RETICOLO CRISTALLINO

↓ ENERGIA RETICOLARE

AMORFI → VETRI

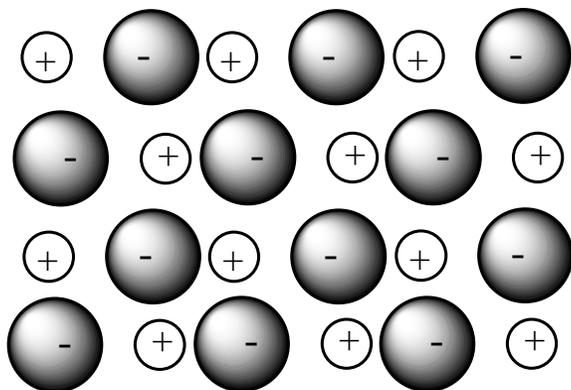
SOLIDI	IONICI
	MOLECOLARI (Van der Waals)
	COVALENTI
	METALLICI

# SOLIDI IONICI

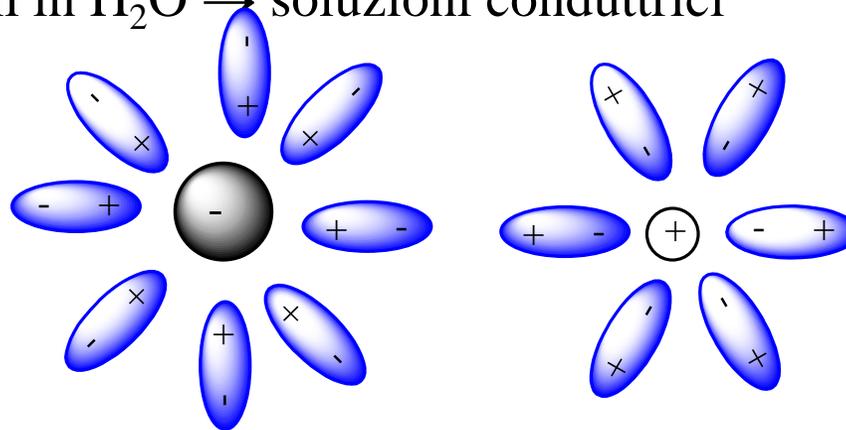
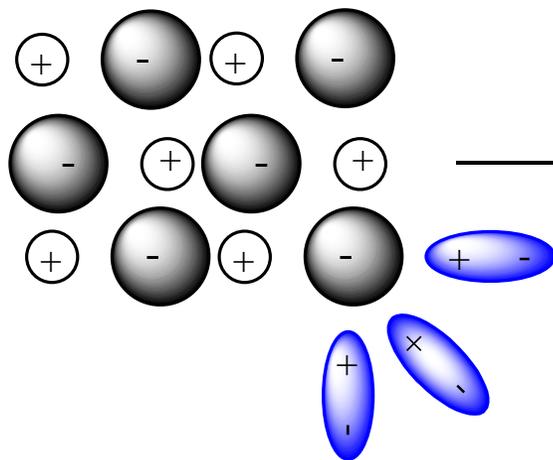
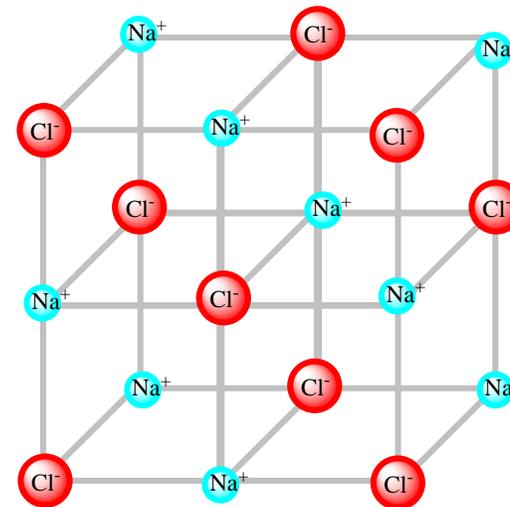
IONI + e – tenuti insieme da INTERAZIONI COULOMBIANE  
LEGAME IONICO → ENERGIA RETICOLARE

Ioni positivi (cationi) → elementi aventi basso I (metalli)

Ioni negativi (anioni) → elementi aventi alta Ae (non metalli)



- Alto p.f.
- Fragilità
- Isolanti
- Conduttori se fusi
- Solubili in H<sub>2</sub>O → soluzioni conduttrici



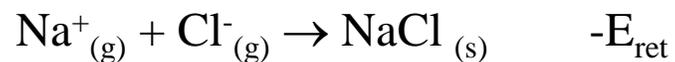
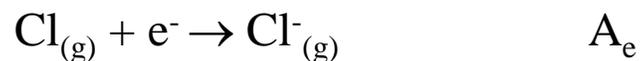
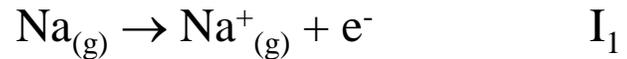
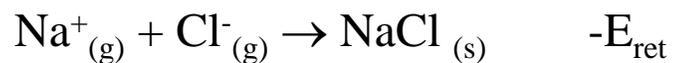
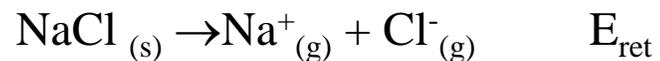
# LEGAME IONICO

Ioni positivi e negativi tenuti insieme da interazioni elettrostatiche

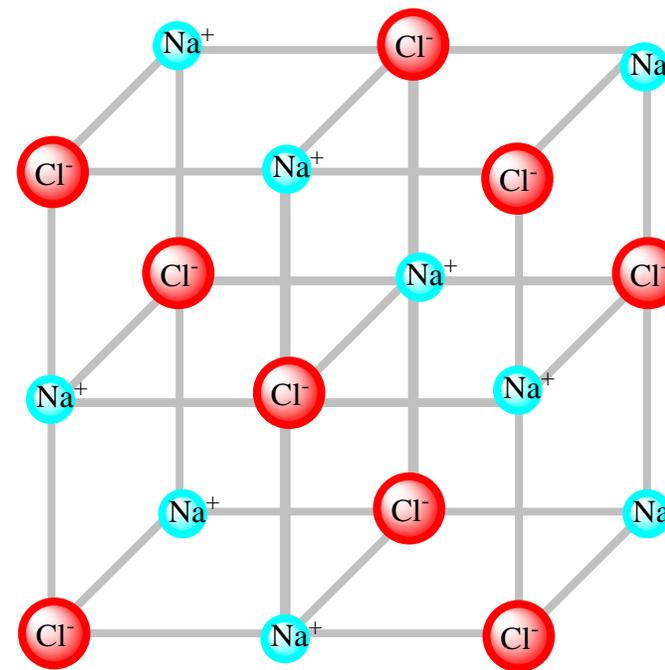
Ioni positivi (cationi) → elementi aventi basso I (metalli)

Ioni negativi (anioni) → elementi aventi alta  $A_e$  (non metalli)

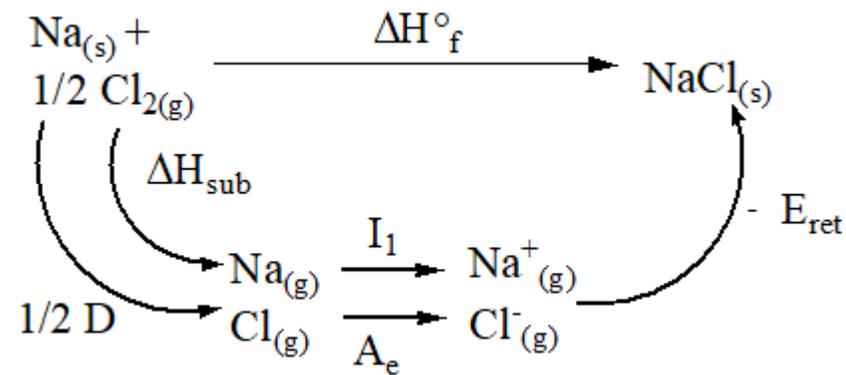
## Energia reticolare



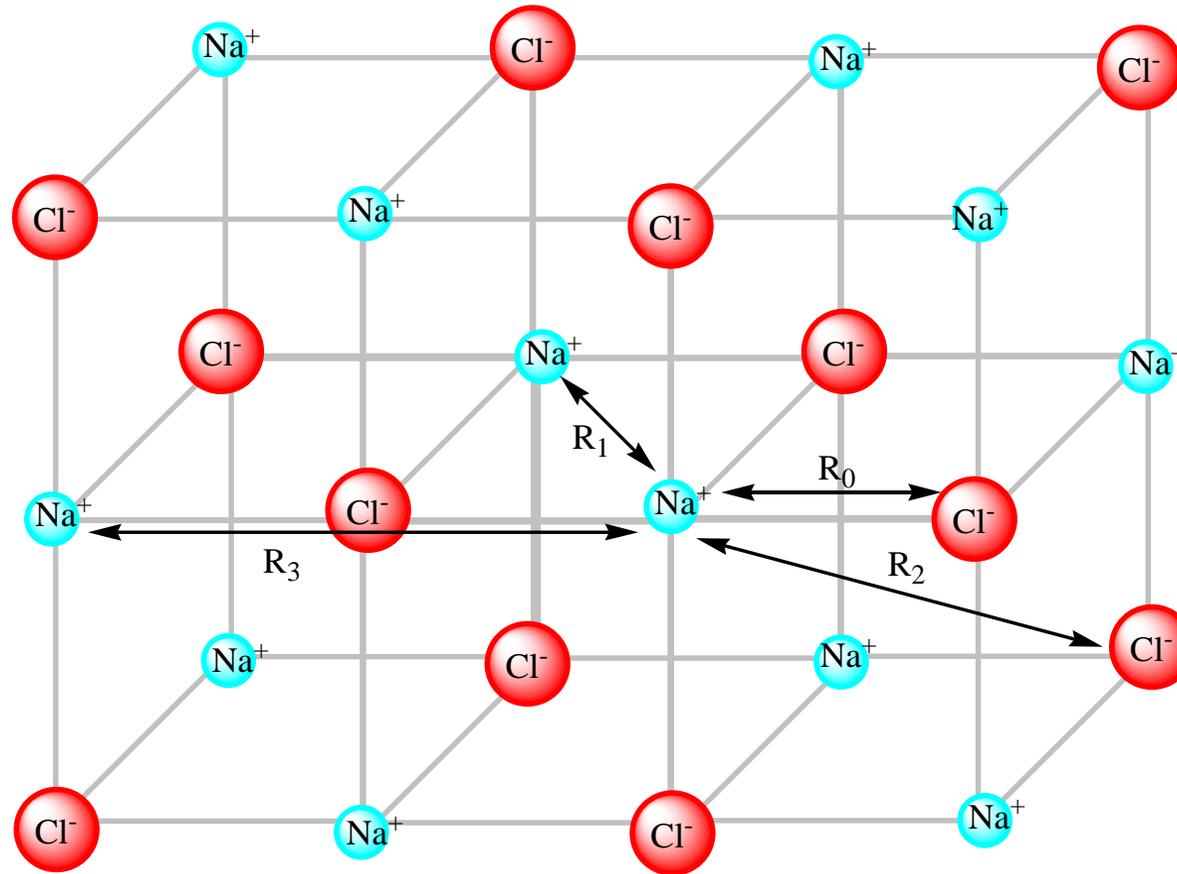
$$\Delta H_f = \Delta H_{\text{sub}} + I_1 + \frac{1}{2} D + A_e - E_{\text{ret}}$$



## CICLO DI BORN-HABER



# Costanti di Madelung



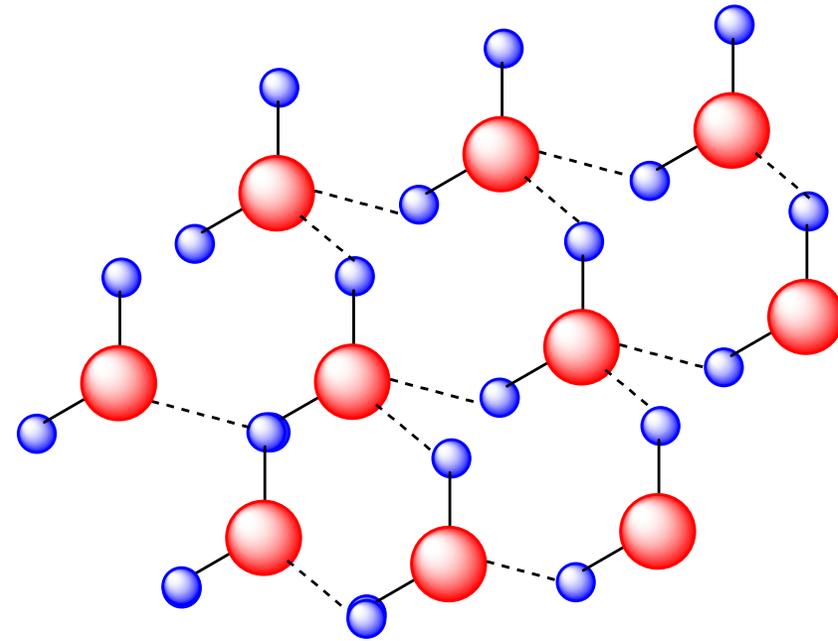
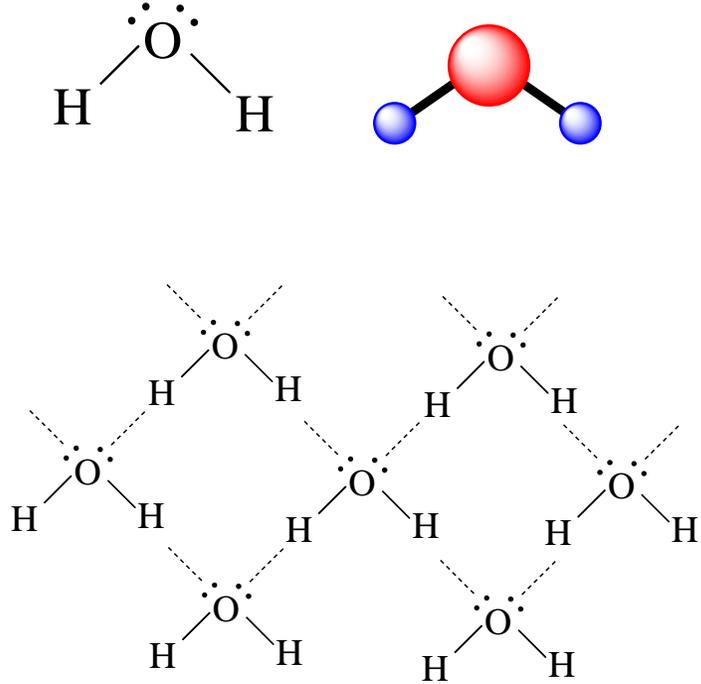
$$R_1 = \sqrt{2}R_0; R_2 = \sqrt{3}R_0; R_3 = 2R_0 \dots$$

$$E_{\text{MAD}} = -6 \frac{e^2}{R_0} + 12 \frac{e^2}{\sqrt{2}R_0} - 8 \frac{e^2}{\sqrt{3}R_0} + 6 \frac{e^2}{2R_0} + \dots = -E_{\text{Ret}}$$

## SOLIDI MOLECOLARI

MOLECOLE TENUTE INSIEME DA:

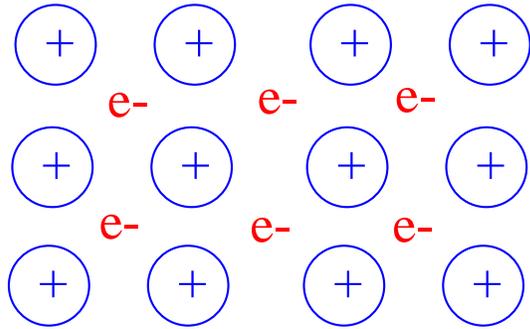
- FORZE DI VAN DER WAALS
- LEGAME IDROGENO
- Es.  $\text{H}_2\text{O}$ ,  $\text{I}_2$ ,  $\text{CO}_2$ ,  
composti organici etc.



Basso pf  
isolanti

SOLIDI METALLICI

→ LEGAME METALLICO



RETICOLO CRISTALLINO

→ IONI METALLICI

ELETTRONI DI VALENZA

→ MARE DI FERMI

CONDUCIBILITA'

-ELETTRICA

-TERMICA

Alto pf

MALLEABILITA',

DUTTILITA'

Leggi di Ohm

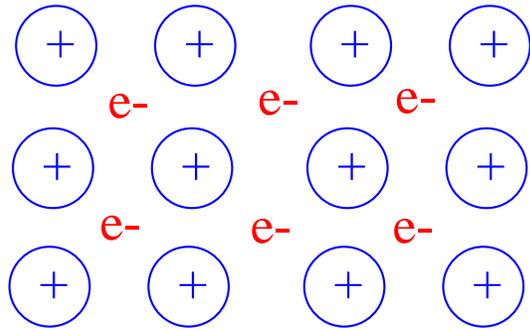
$$V = R \cdot I$$

$$R = \rho \frac{l}{S}$$

$$\rho = \rho^0 (1 + \alpha T)$$

SOLIDI METALLICI

→ LEGAME METALLICO

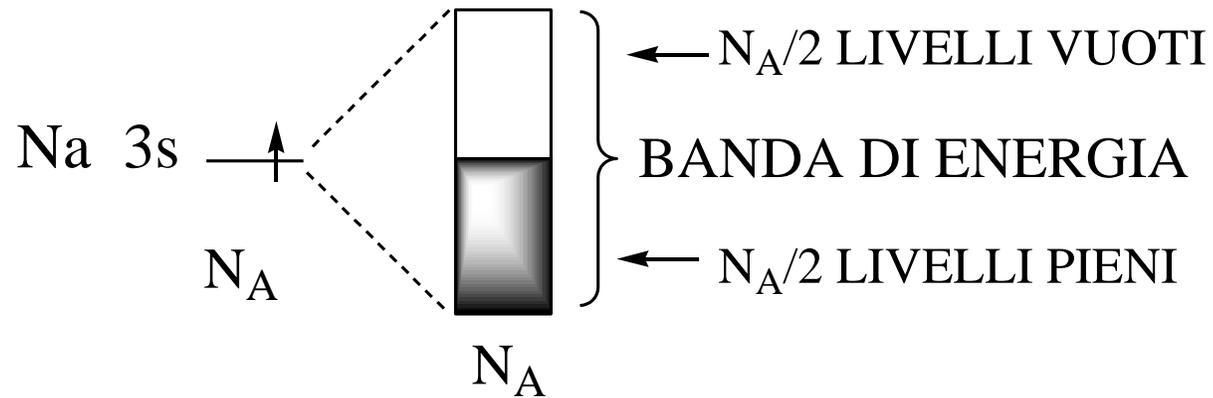


RETICOLO CRISTALLINO

→ IONI METALLICI

ELETTRONI DI VALENZA

→ MARE DI FERMI



CONDUCIBILITA'

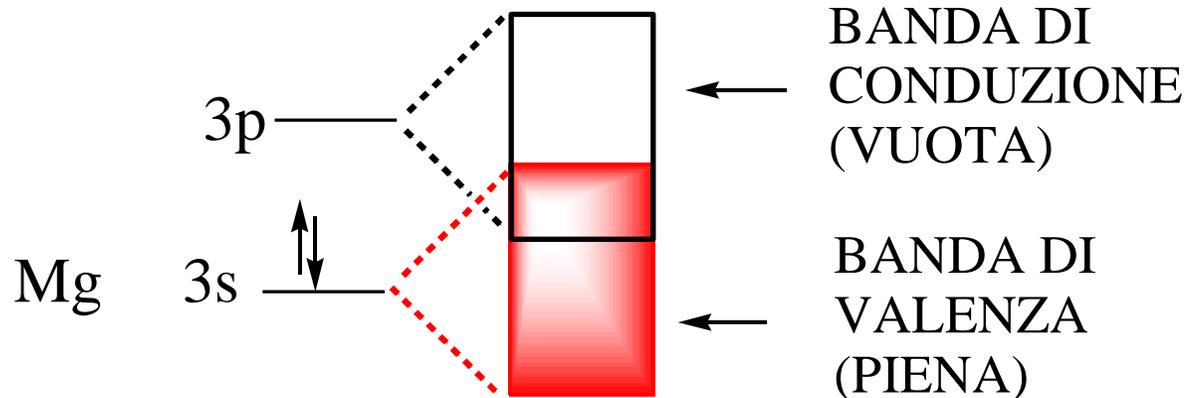
-ELETTRICA

-TERMICA

Alto pf

MALLEABILITA',

DUTTILITA'

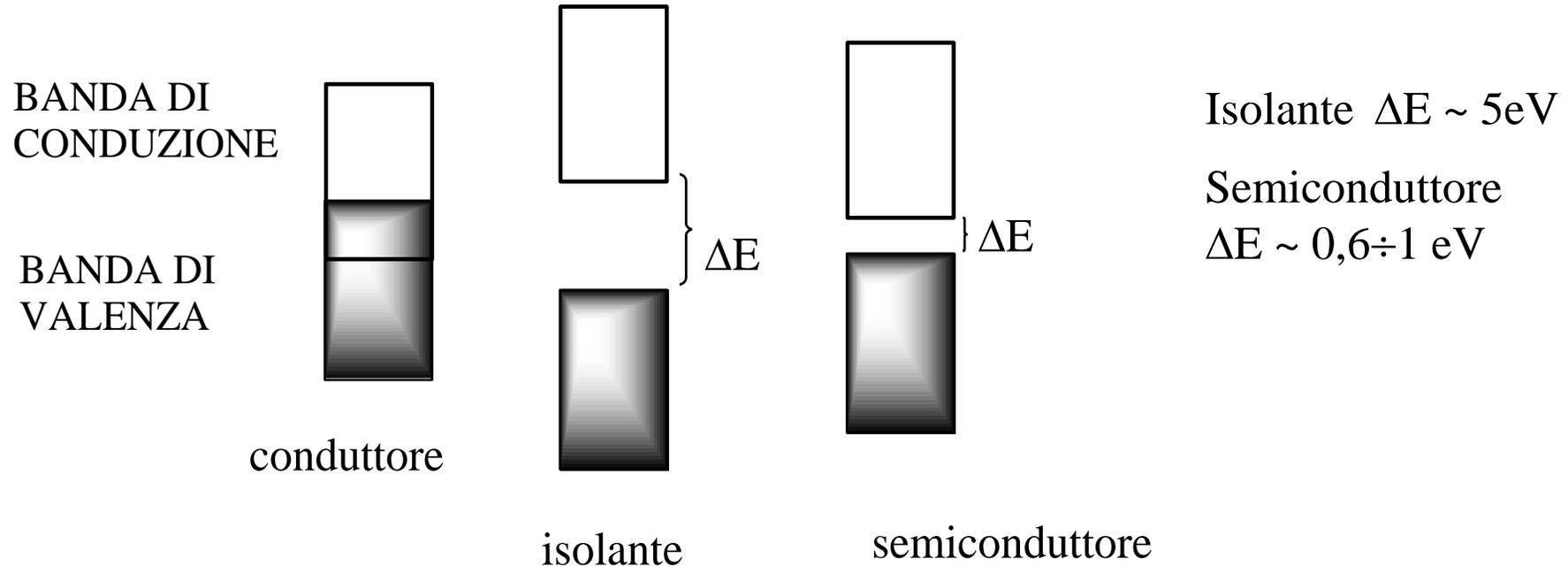


Leggi di Ohm

$$V = R \cdot I$$

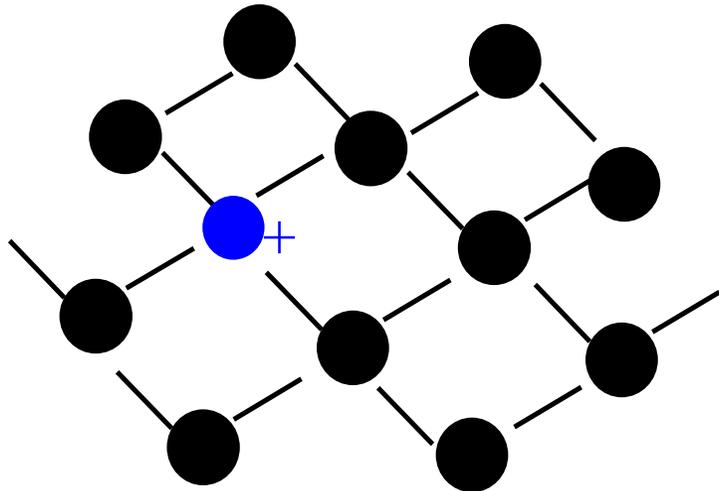
$$R = \rho \frac{l}{S}$$

$$\rho = \rho^0(1 + \alpha T)$$

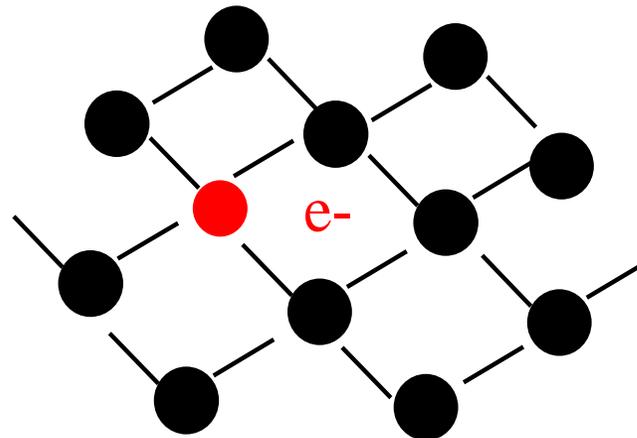


Semiconduttori es. Si

Drogaggio p es. B



Drogaggio n es. P



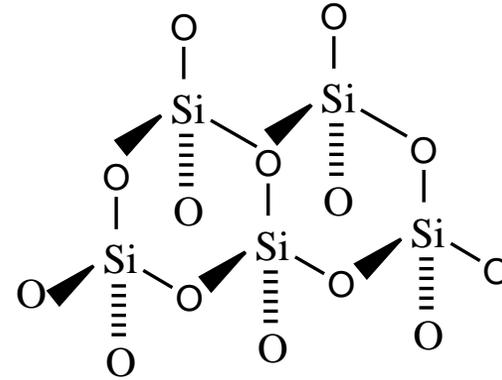
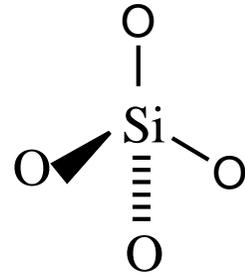
# SOLIDI COVALENTI

IL SOLIDO E' COME UN'UNICA GRANDE MOLECOLA TENUTA  
INSIEME DA INTERAZIONI COVALENTI

Es. C, SiO<sub>2</sub>      Alto pf, durezza, isolanti

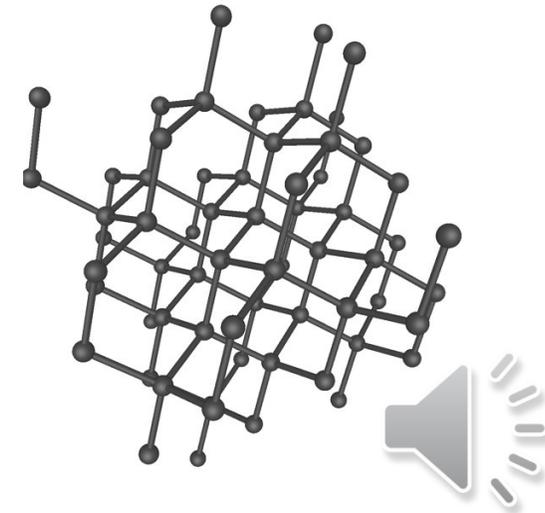
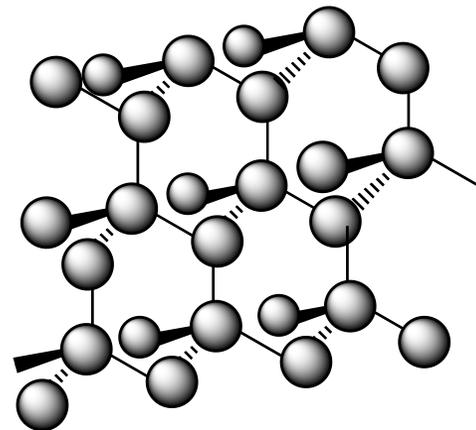
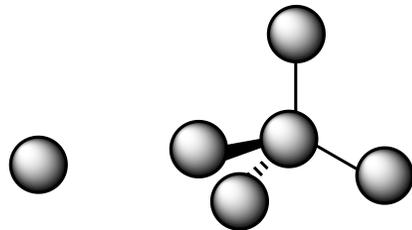
SiO<sub>2</sub>

Ibridazione sp<sup>3</sup>



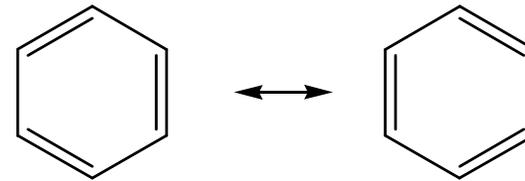
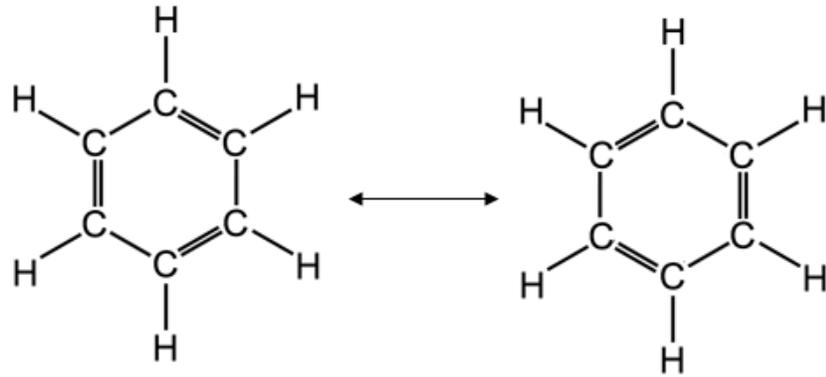
C: diamante

Ibridazione sp<sup>3</sup>

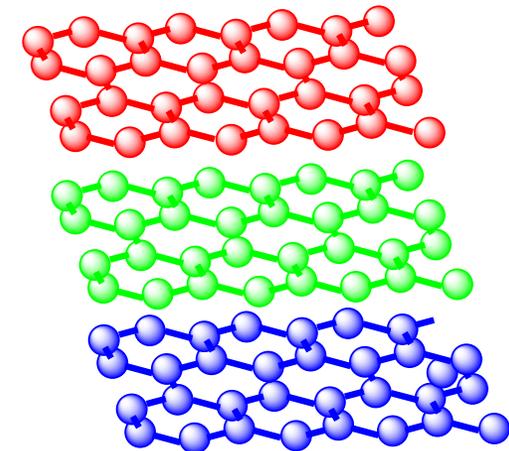
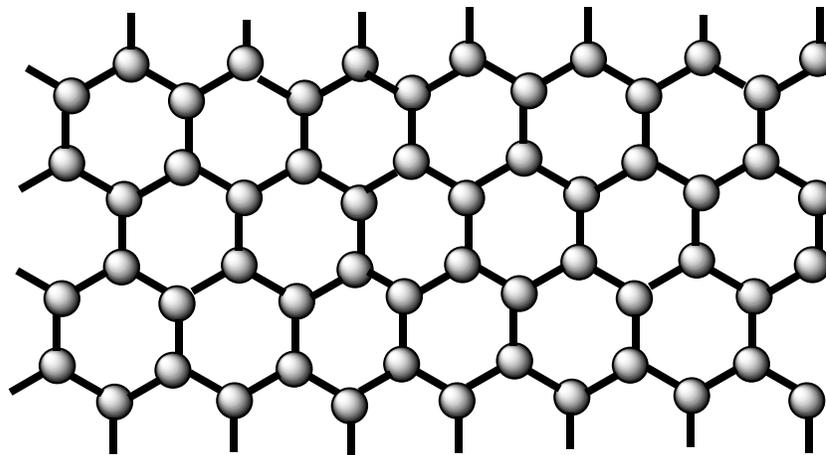
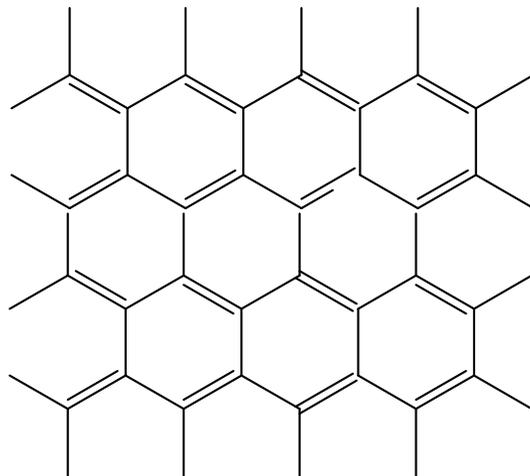


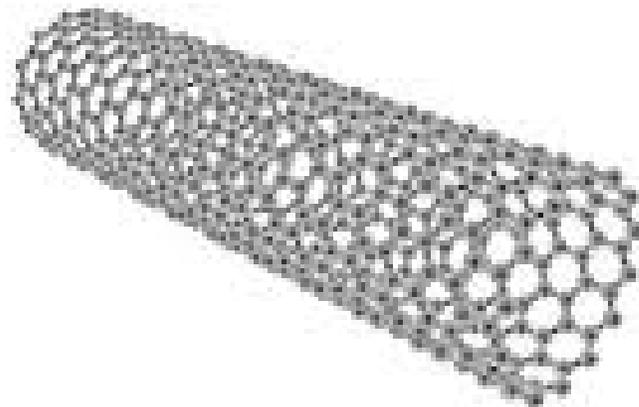
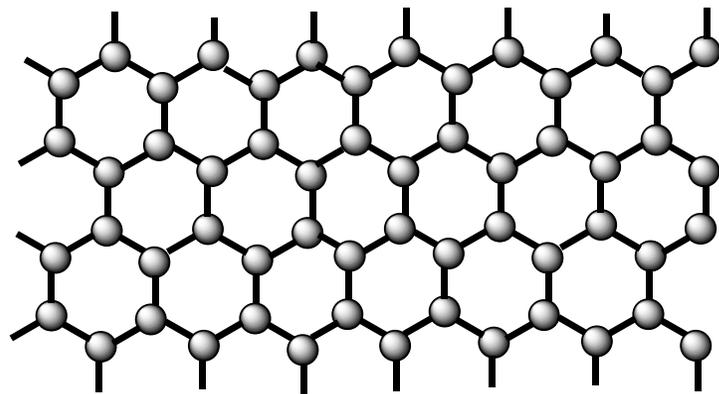
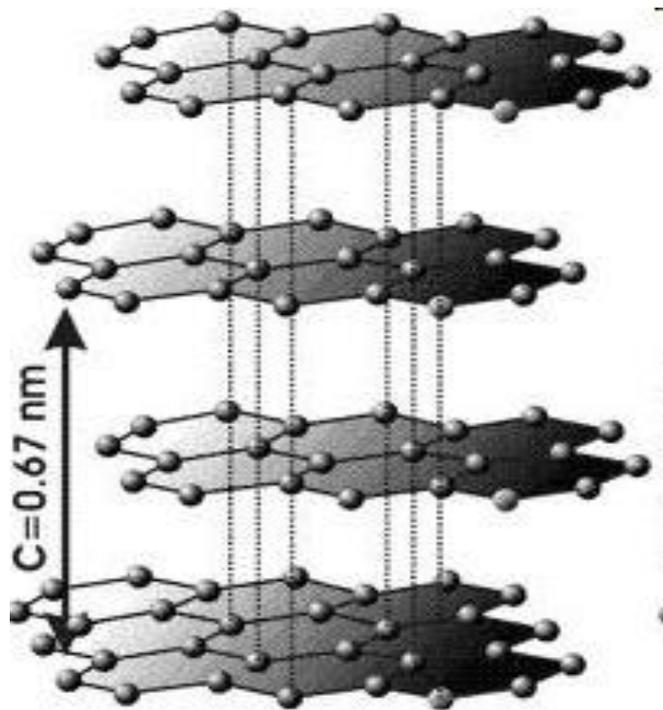
C: grafite  
Ibridazione  $sp^2$

Forme allotropiche



anisotropia





$C_{60}$

