ENLACE Y PROPIEDADES

Una visión global de la variación de las propiedades de los elementos y su compuestos químicos

Flaviano García USP-CEU

El azufre es un sólido:

FGA12

La afirmación es: ¿V o F?

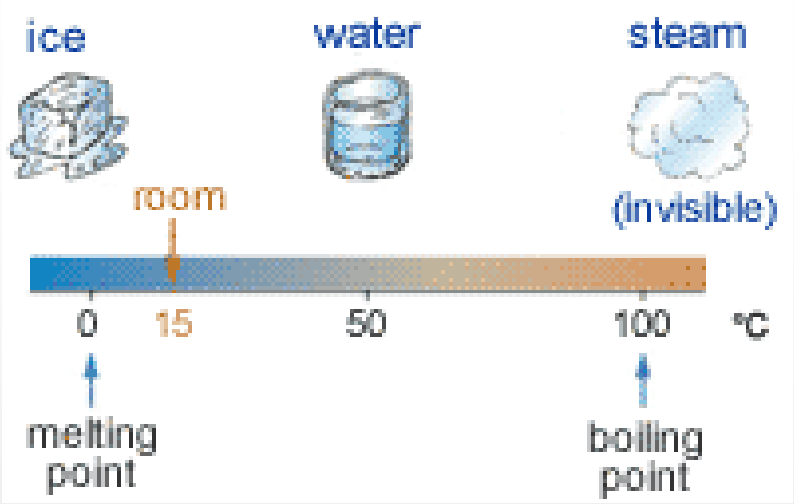
Diapositiva 2

FGA12 Sulphur-gas condensing and sublimating into liquid and solid sulphur at the sulphur mine inside Ijen's crater. Isla de Java

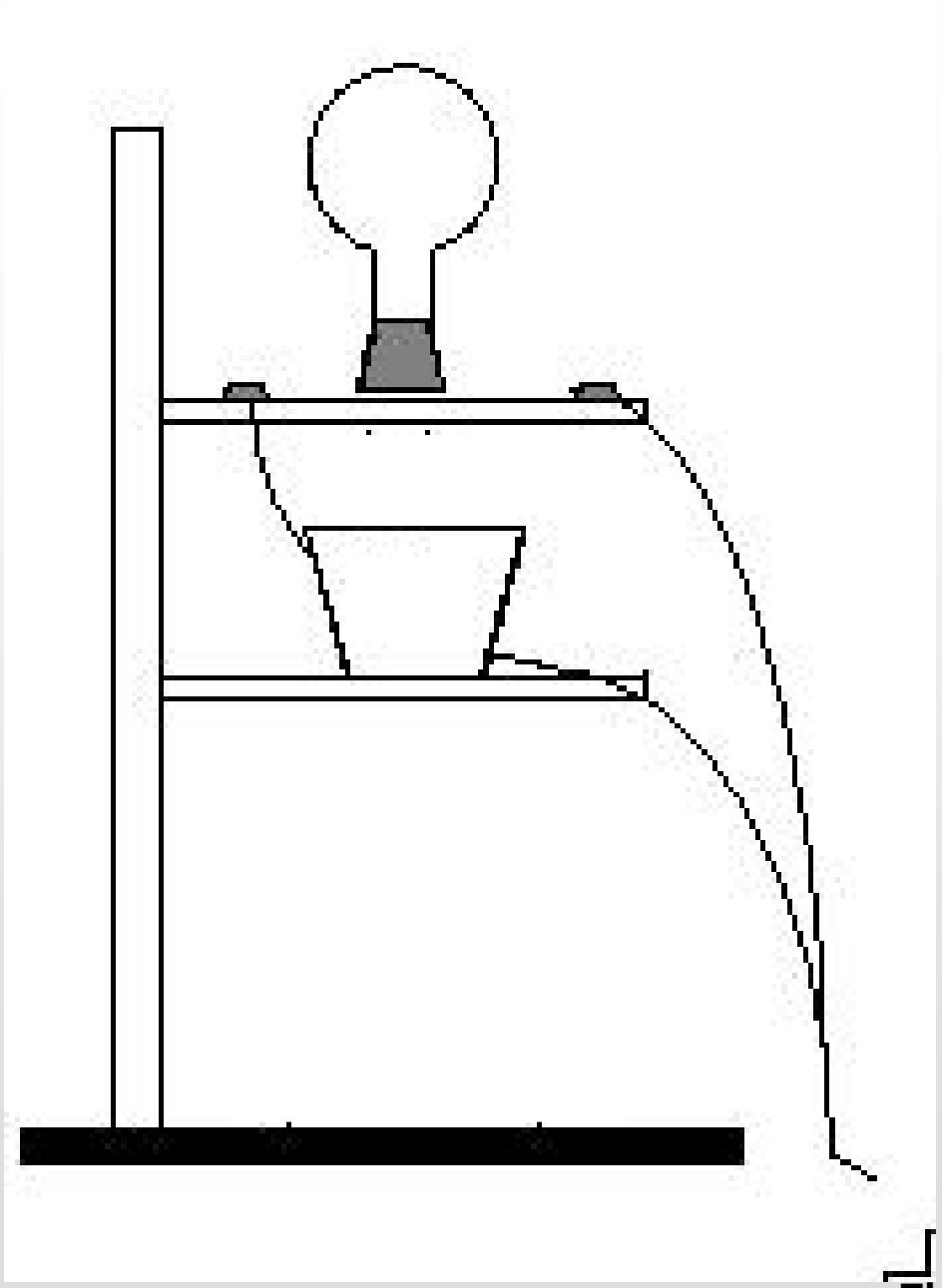
Flaviano García Alvarado; 03/11/2006

LAS SUSTANCIAS QUÍMICAS SON SÓLIDAS, LÍQUIDAS O GASEOSAS

EN FUNCIÓN DE LA TEMPERATURA



T=25 ºC




DISTILLED
H_2O

CONCEPTO A DESARROLLAR:

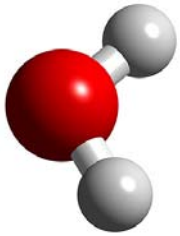
Las propiedades dependen del tipo de enlace
entre àtomos o moléculas

Propiedades térmicas: PF, PE (estado de agregación)

Propiedades químicas: reactividad (estabilidad vs. no estabilidad)

Propiedades físicas: conductividad, brillo, maleabilidad, fragilidad

H_2O (s)



D_2O (s)

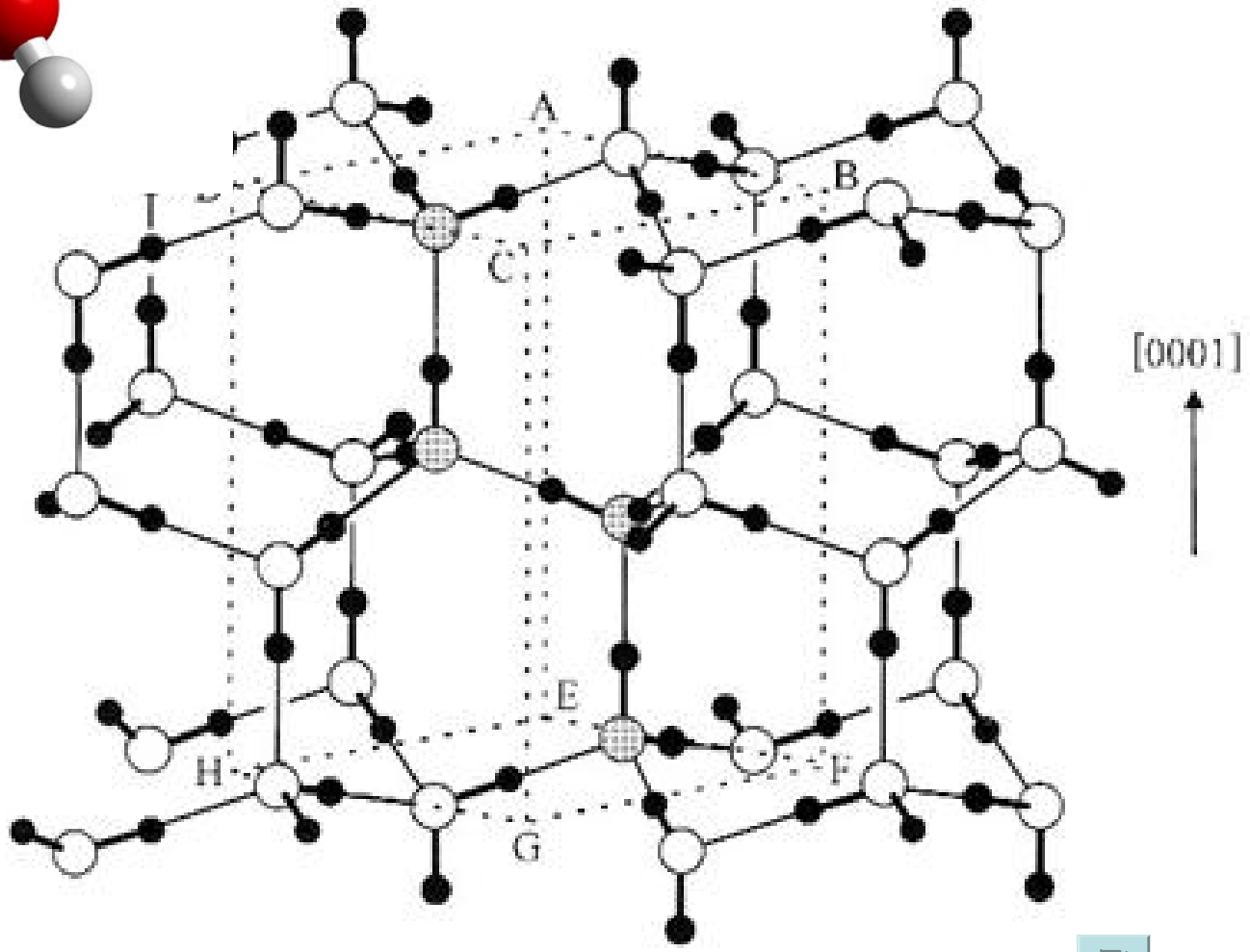
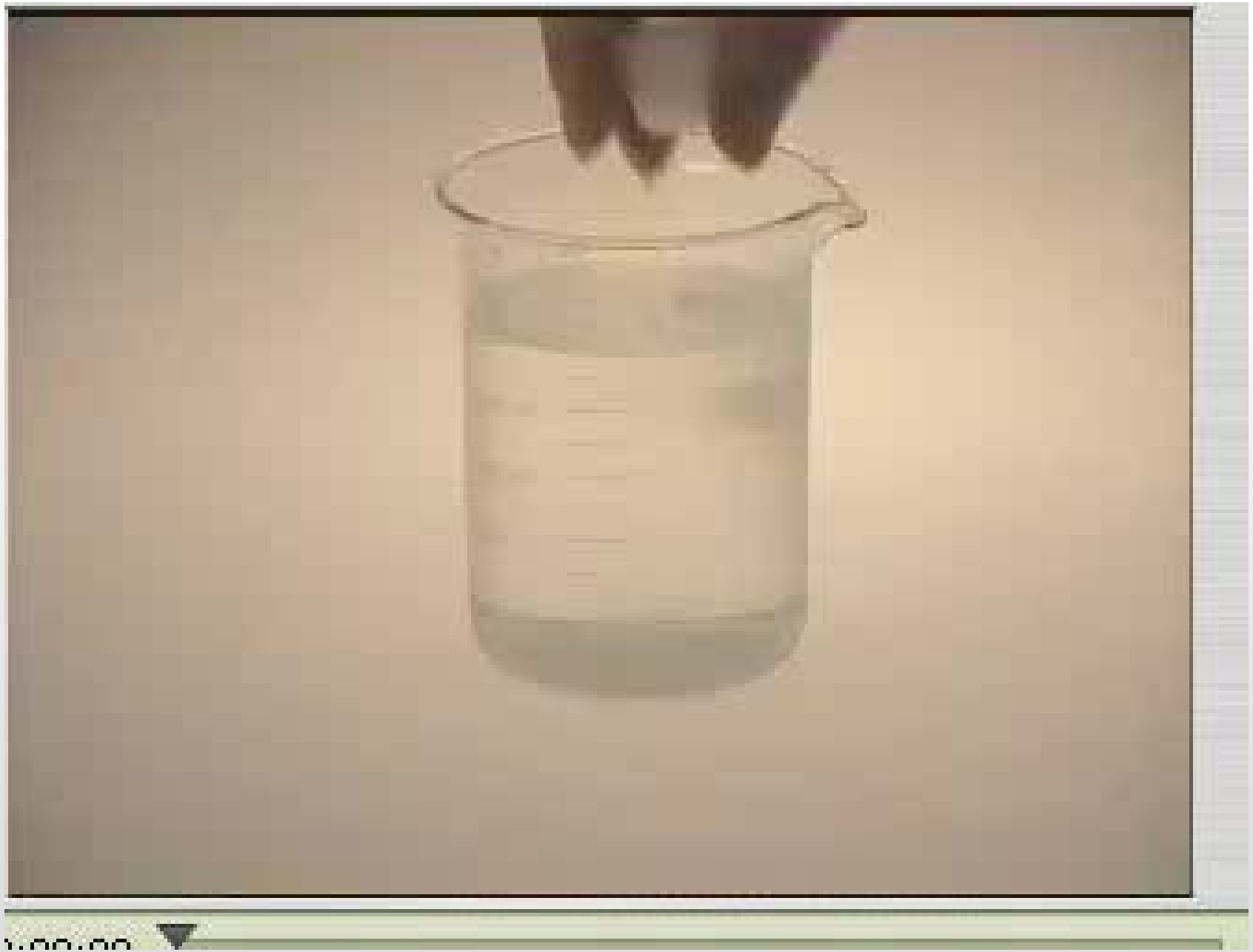


Figure 2: Crystal structure of ice Ih

FGA19



FGA19 Chemical Concepts Demonstrated: Density, deuteration of water

Demonstration:

The first set of ice cubes is composed of normal water. The second set is composed of D2O.
Add the cubes to the beaker of water.

Observations:

The regular ice cubes float in water. The deuterated ice cubes sink.

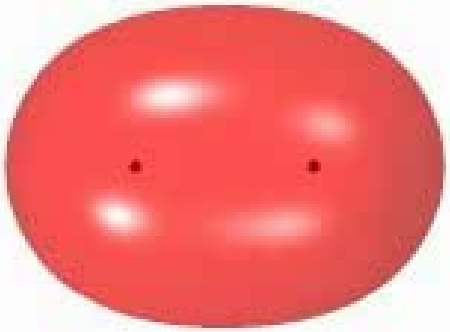
Explanation:

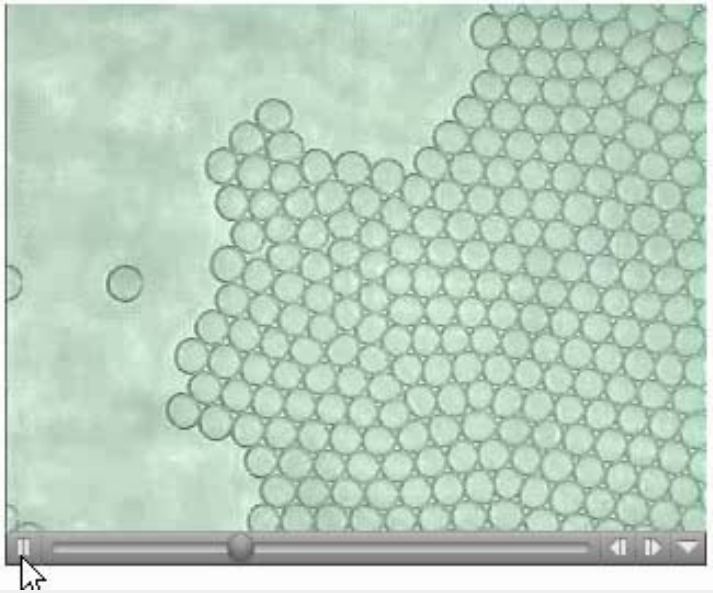
Water is less dense in its solid state than in its liquid state. This property allows solid water (ice) to float in liquid water (objects less dense than the liquid they are in float while objects more dense than the liquid sink).

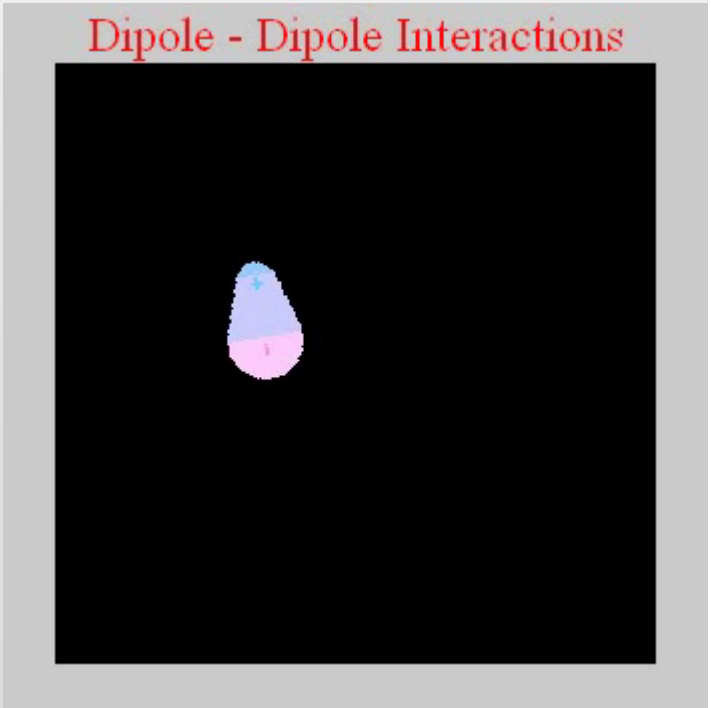
Ice made from deuterated water, on the other hand, doesn't float. The hydrogen atoms in a deuterated water molecule are replaced with deuterium atoms. Deuterium is an isotope of hydrogen that is twice as heavy due to an added neutron. Deuterated ice is about 10% heavier (and, therefore, more dense, because the water molecules still take up the same space) than regular ice. The density of deuterated ice turns out to be 1.105 g/cm3. This density is greater than the density of liquid water, so the deuterated cubes sink.

Flaviano García Alvarado; 06/09/2006

TIPOS DE ENLACES



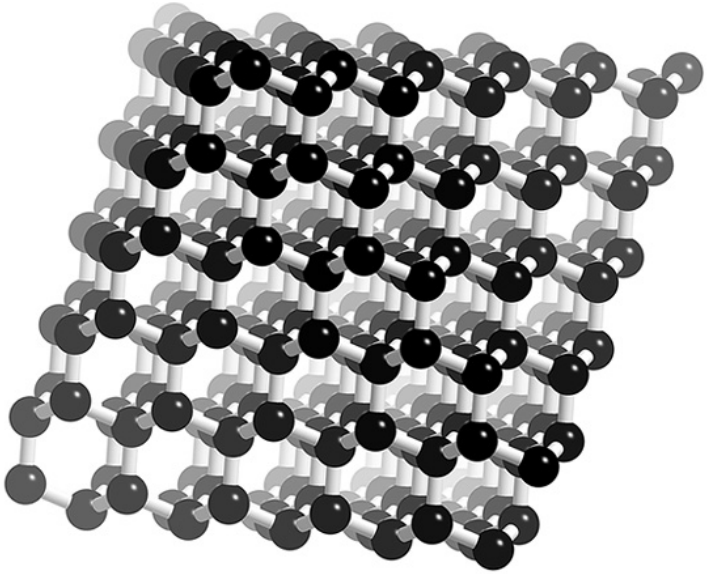




ENLACE COVALENTE

- ♦ **Sólidos covalentes reticulares**
- ♦ **Sólidos moleculares**

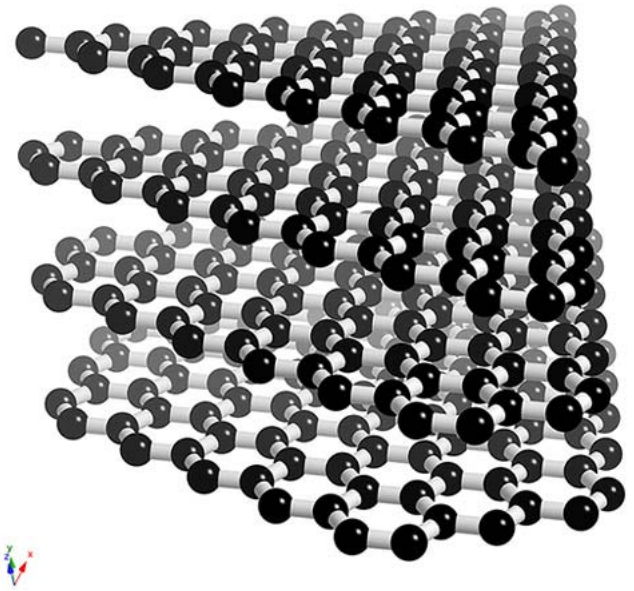
Diamante



ENLACE IÓNICO

ENLACE METÁLICO

Grafito

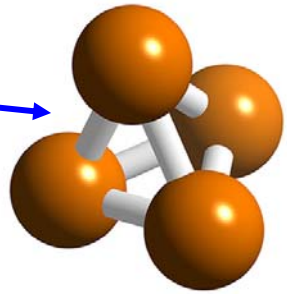


ENLACE ENTRE MOLÉCULAS

ENLACE COVALENTE

- **Sólidos covalentes reticulares**
- **Sólidos moleculares**

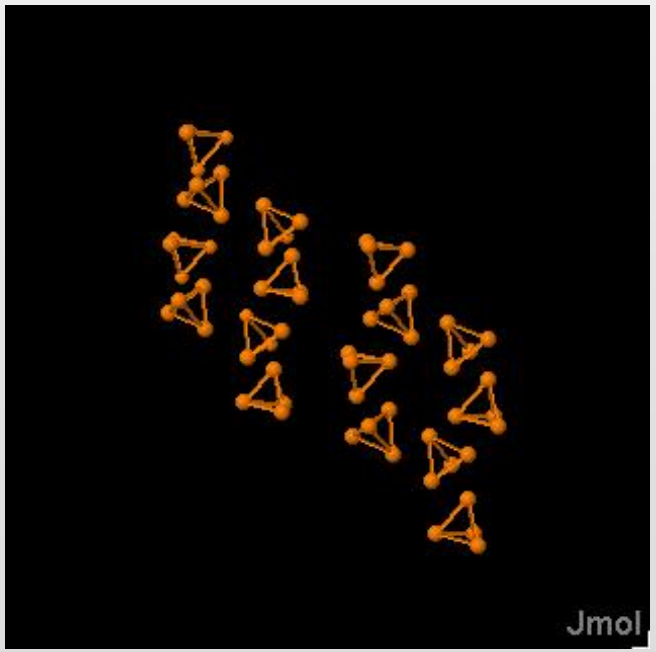
Molécula P_4



ENLACE IÓNICO

ENLACE METÁLICO

P (sólido)

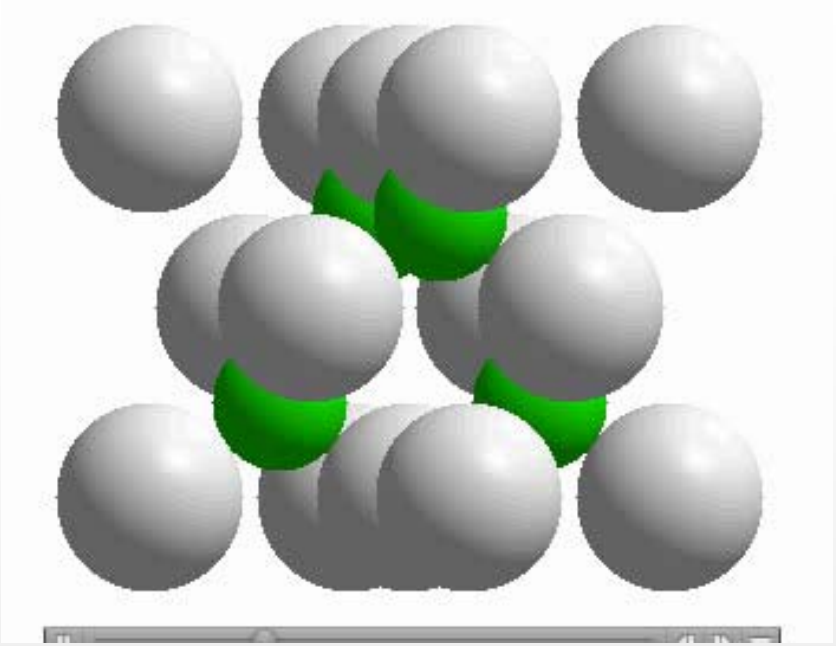


ENLACE ENTRE MOLÉCULAS
(FUERZAS INTERMOLECULARES)

ENLACE COVALENTE

ENLACE IÓNICO<> SÓLIDOS IÓNICOS

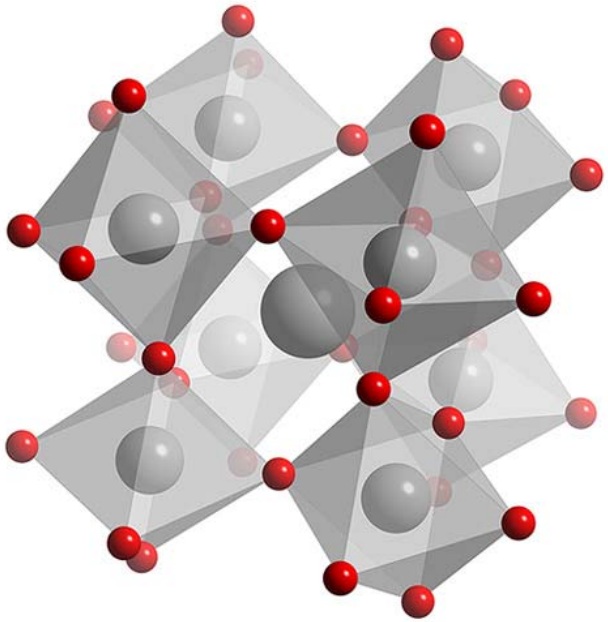
ZnS



ENLACE METÁLICO

ENLACE ENTRE MOLÉCULAS (FUERZAS INTERMOLECULARES)

$CaTiO_3$



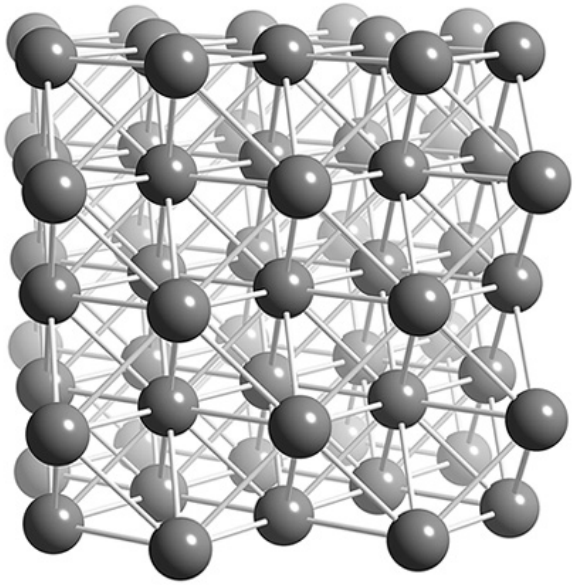
ENLACE COVALENTE

ENLACE IÓNICO

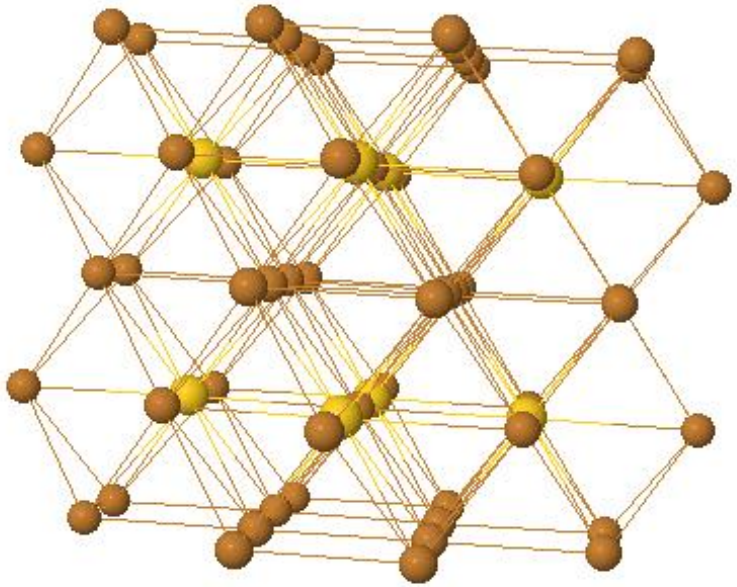
ENLACE METÁLICO
<> Sólidos metálicos

ENLACE ENTRE MOLÉCULAS
(FUERZAS INTERMOLECULARES)

Cu



Cu_3Au



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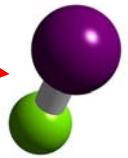
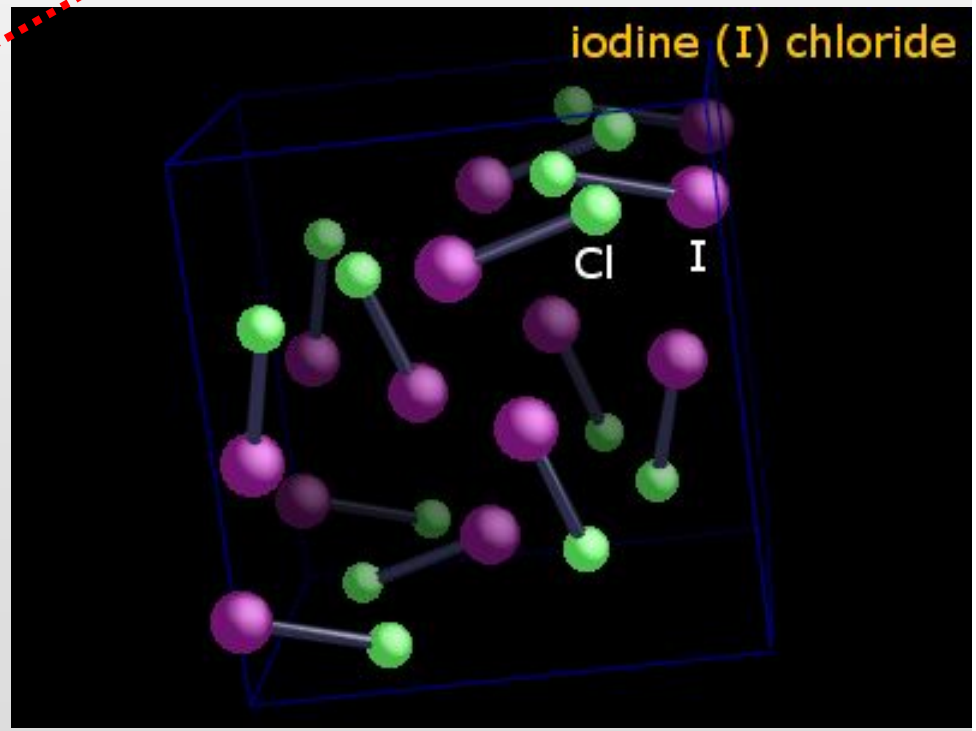


ICl

ENLACE IÓNICO

ENLACE METÁLICO



ENLACE ENTRE MOLÉCULAS (FUERZAS INTERMOLECULARES)

SÓLIDOS MOLECULARES

ENLACE COVALENTE

H_2O

ENLACE IÓNICO

ENLACE METÁLICO

ENLACE ENTRE MOLÉCULAS (FUERZAS INTERMOLECULARES)

SÓLIDOS MOLECULARES

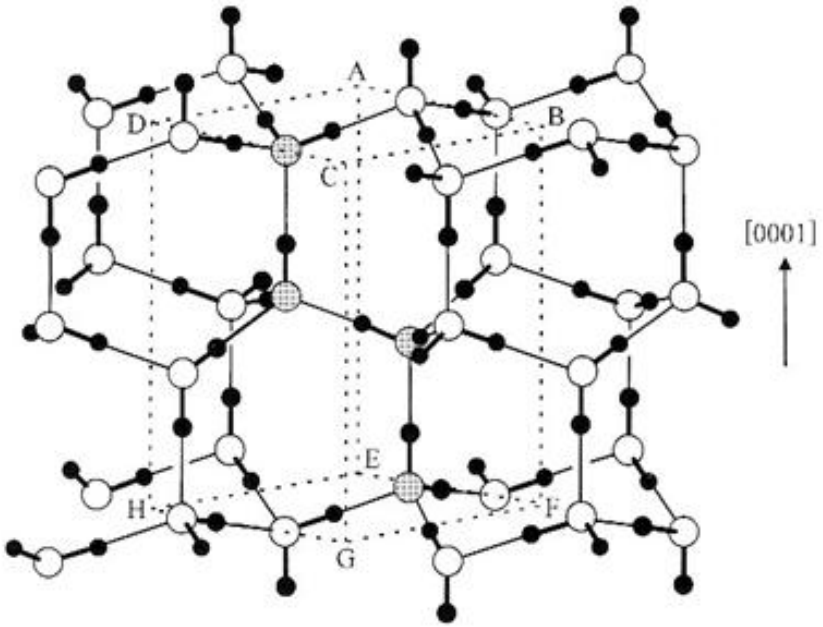
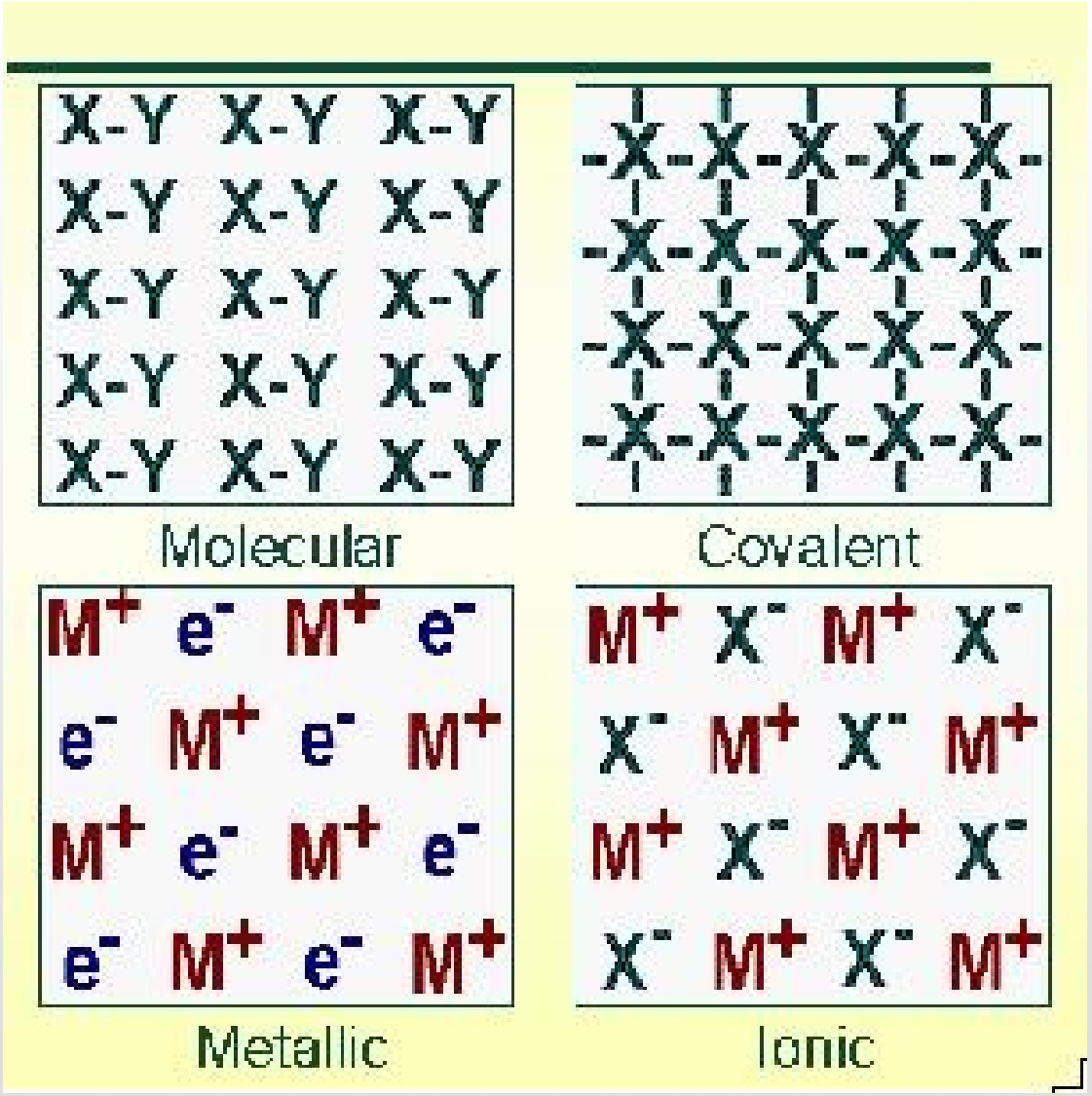
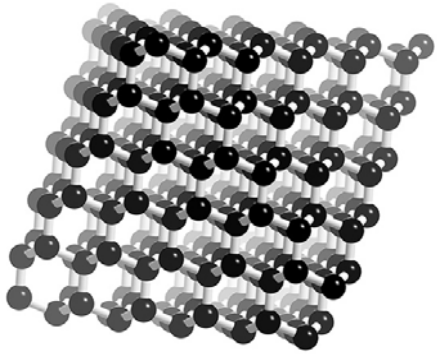


Figure 2: Crystal structure of ice Ih

Tipos de sólidos, enlace y fuerzas intermoleculares.



COVALENTES RETICULARES O ATÓMICOS



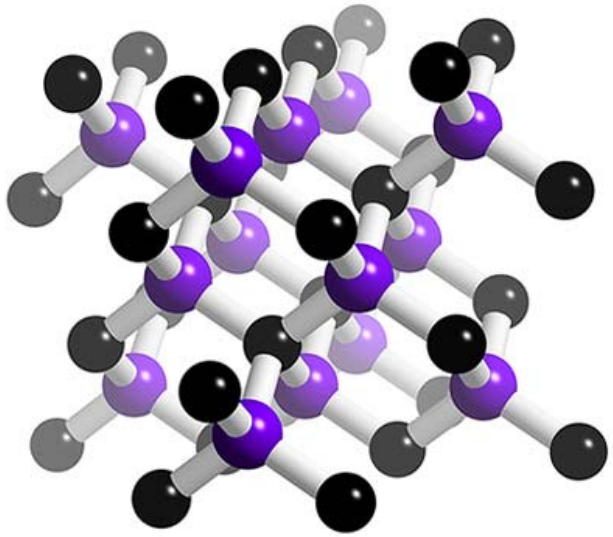
Partículas estructurales: átomos
Fuerzas de unión: covalente (extendido…..)
No existen moléculas

PROPIEDADES GENERALES

Muy duros

No conductores de la electricidad

Altos P_F y P_E



SiC

MOLECULARES

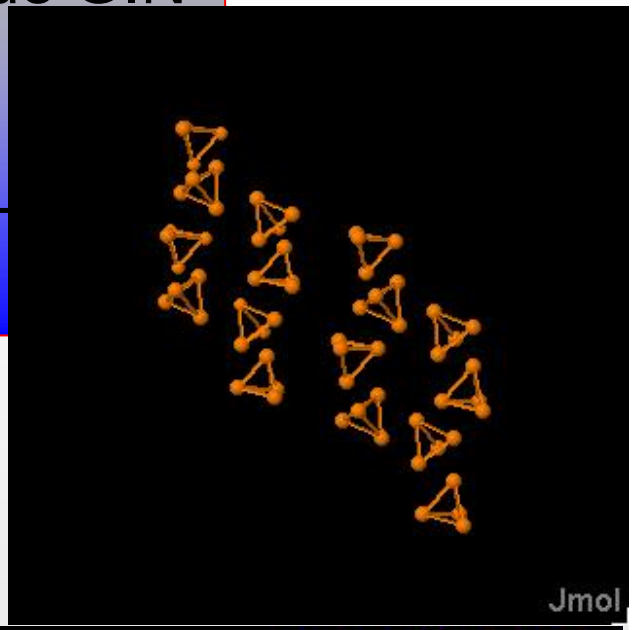
Partículas estructurales: Moléculas, átomos de G.N

Fuerzas de unión:

intramolecular: covalente

intermolecular: dipolo- dipolo, enlace H

Existen moléculas independientes



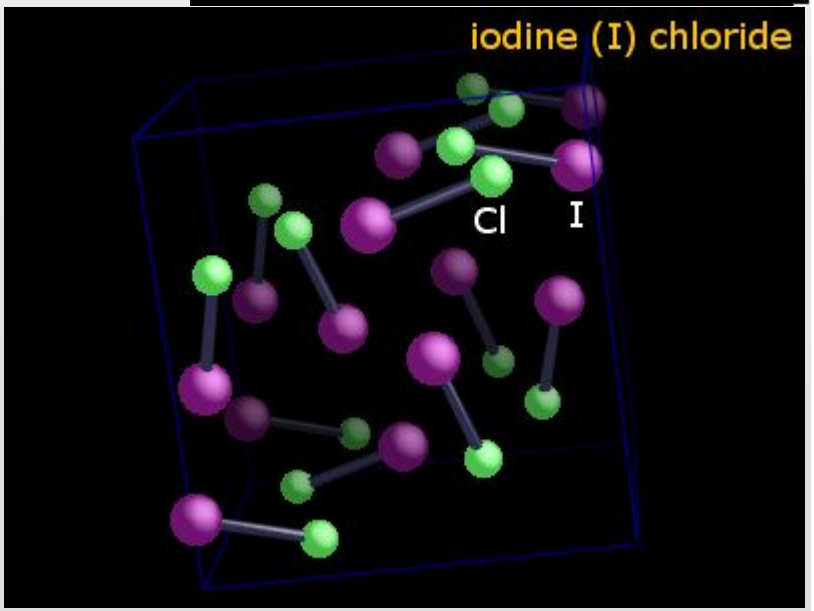
PROPIEDADES GENERALES

Blandos

No conductores de electricidad y calor

Bajos P_F y P_E

Muchos subliman



IÓNICOS

Flaviano García USP-CEU

Partículas estructurales: iones positivos y negativos (cationes y aniones)

Fuerzas de unión: enlace iónico

No existen moléculas independientes

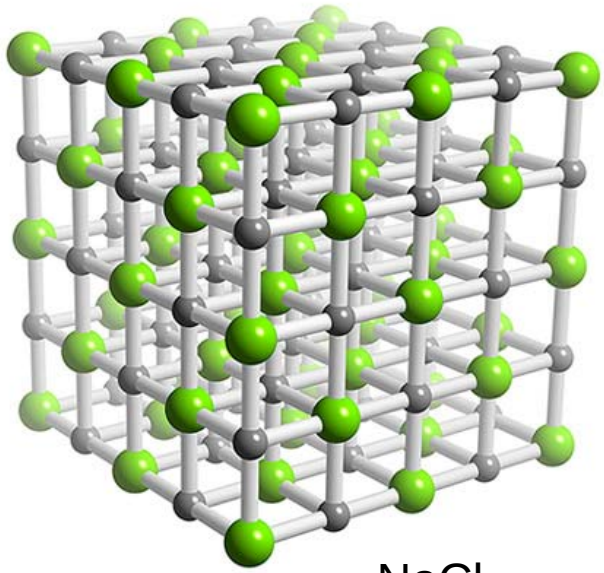
PROPIEDADES GENERALES

Duros

No conductores de electricidad en estado sólido

Conductores en estado fundido

P_F y P_E variables: T moderadas a altas

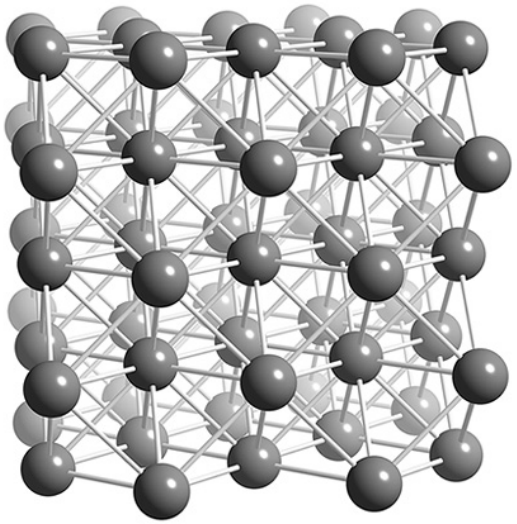


NaCl

METÁLICOS

Flaviano García USP-CEU

Partículas estructurales: átomos electropositivos (metales)
Fuerzas de unión: metálico
No existen moléculas independientes



PROPIEDADES GENERALES

Dureza variable

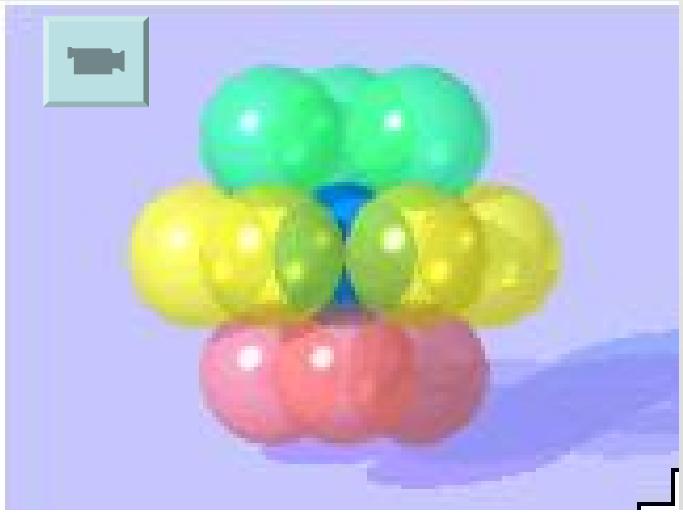
P_F variable (Hg a W)

Buenos conductores de la electricidad

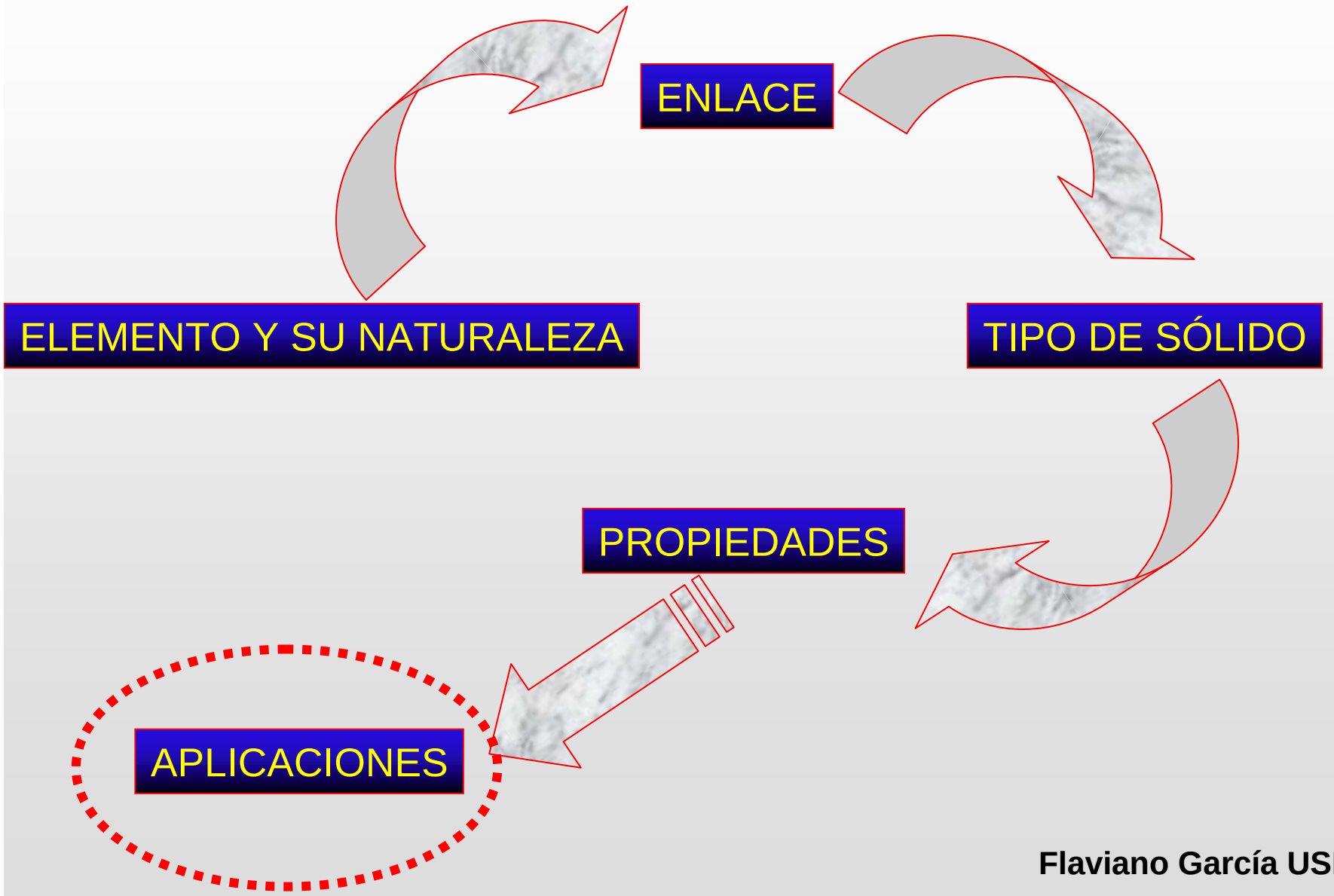
y del calor.

Brillo

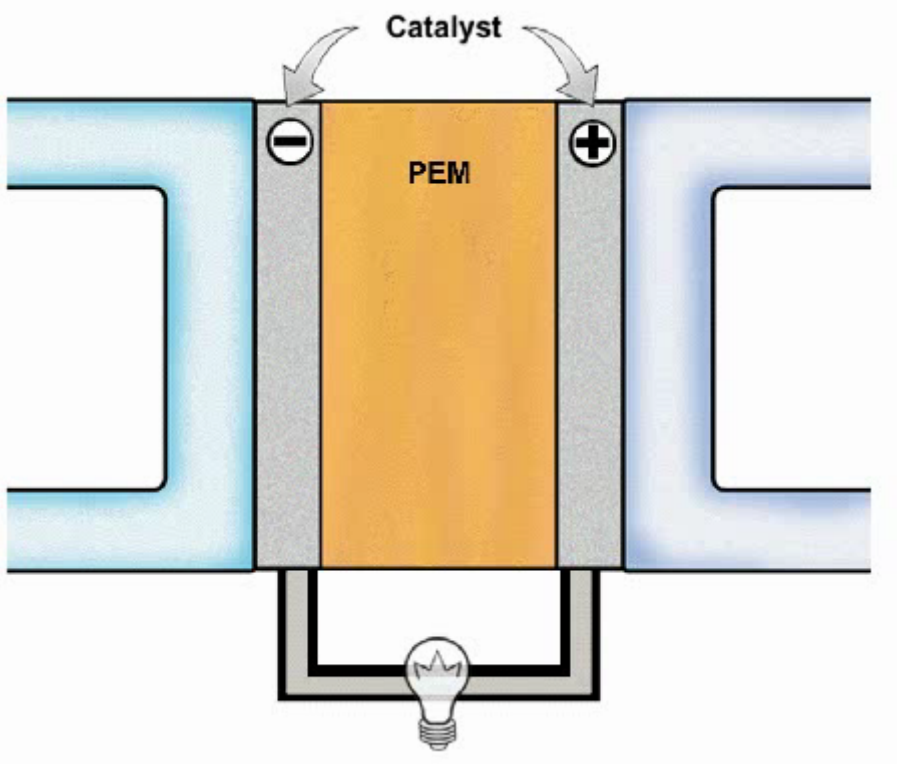
Dúctiles y maleables



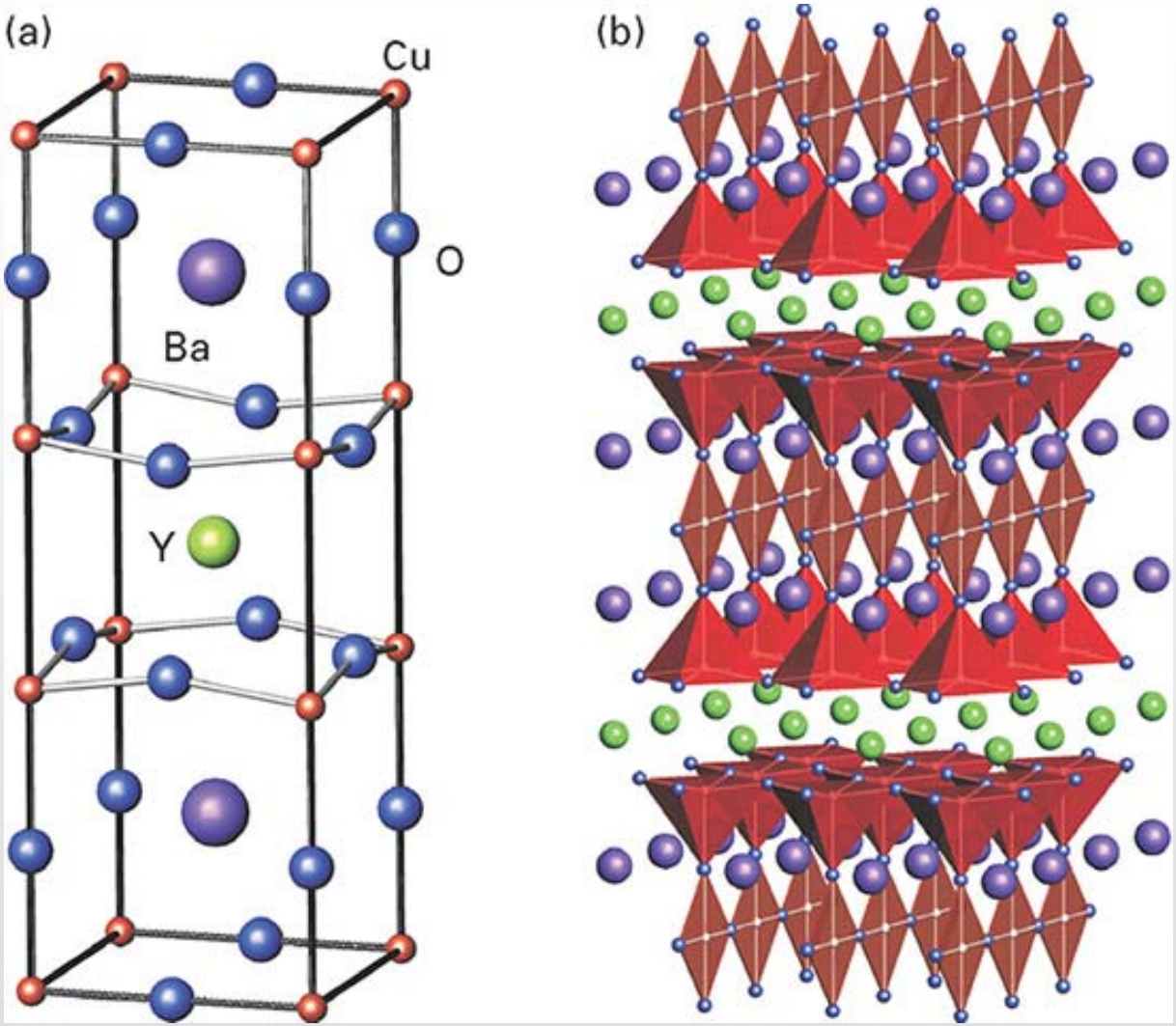
CONCLUSIONES



PILA DE COMBUSTIBLE POLIMERICA; H_2, O_2, polímero, Pt, acero (Fe-C), Cu

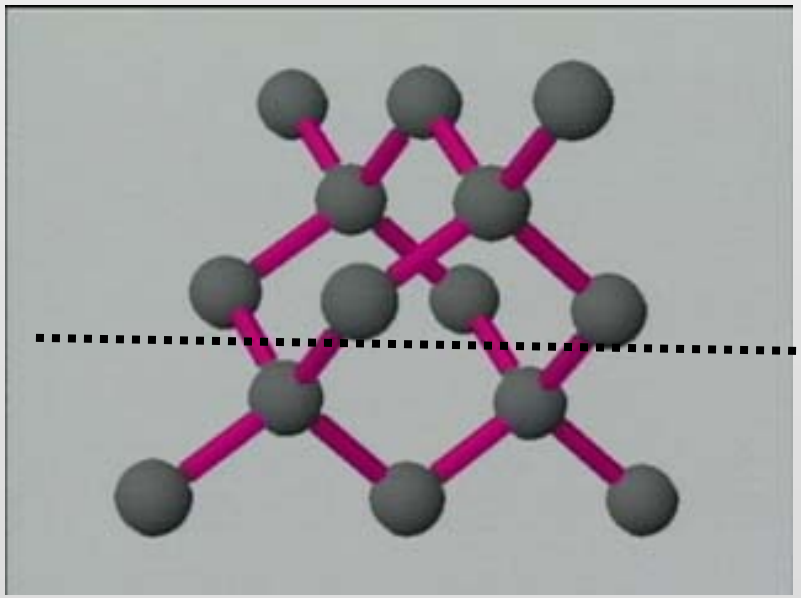


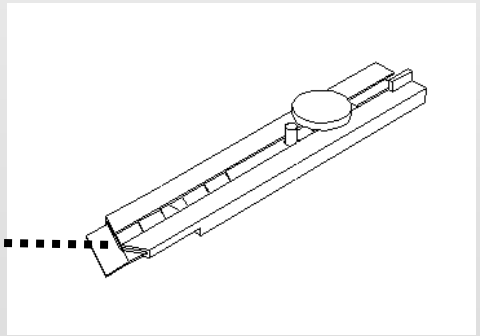
Vidrios (óxido de silicio+…)
W


(a)
Cu
O
Ba
Y
(b)

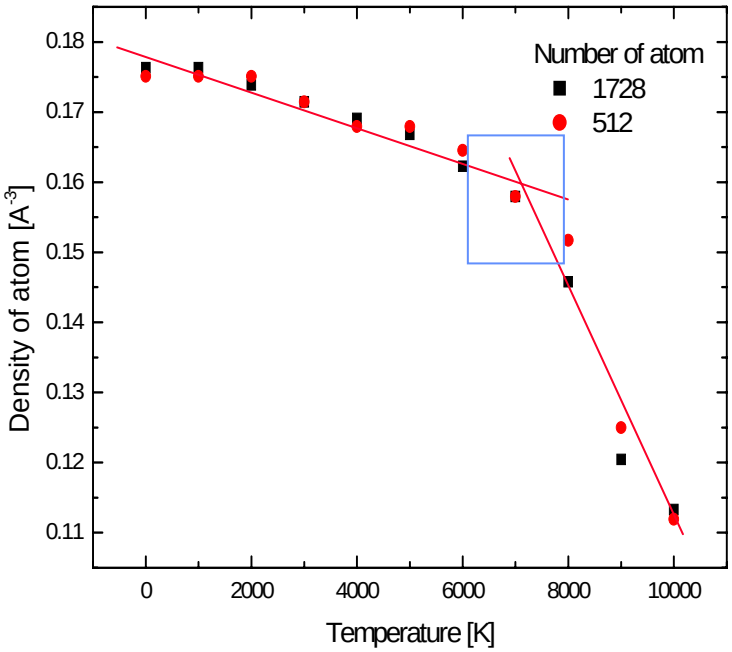
Mohs Scale of Hardness

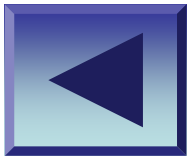
Mineral	Scale Number	Common Objects
Talc	1	
Gypsum	2	Fingernail
Calcite	3	Copper Penny
Fluorite	4	
Apatite	5	Steel Nail
Orthoclase	6	Glass Plate
Quartz	7	
Topaz	8	Streak Plate
Corundum	9	
Diamond	10	

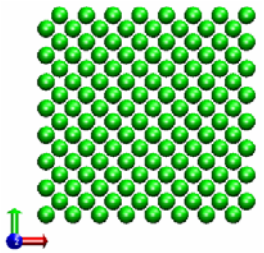




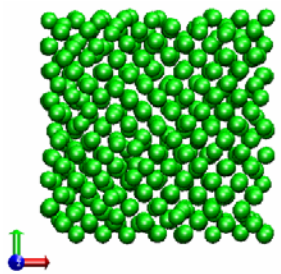
Melting of Diamond



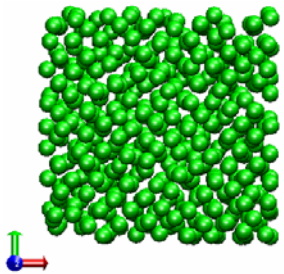




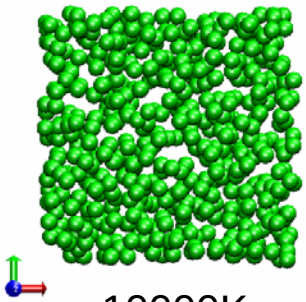
0K



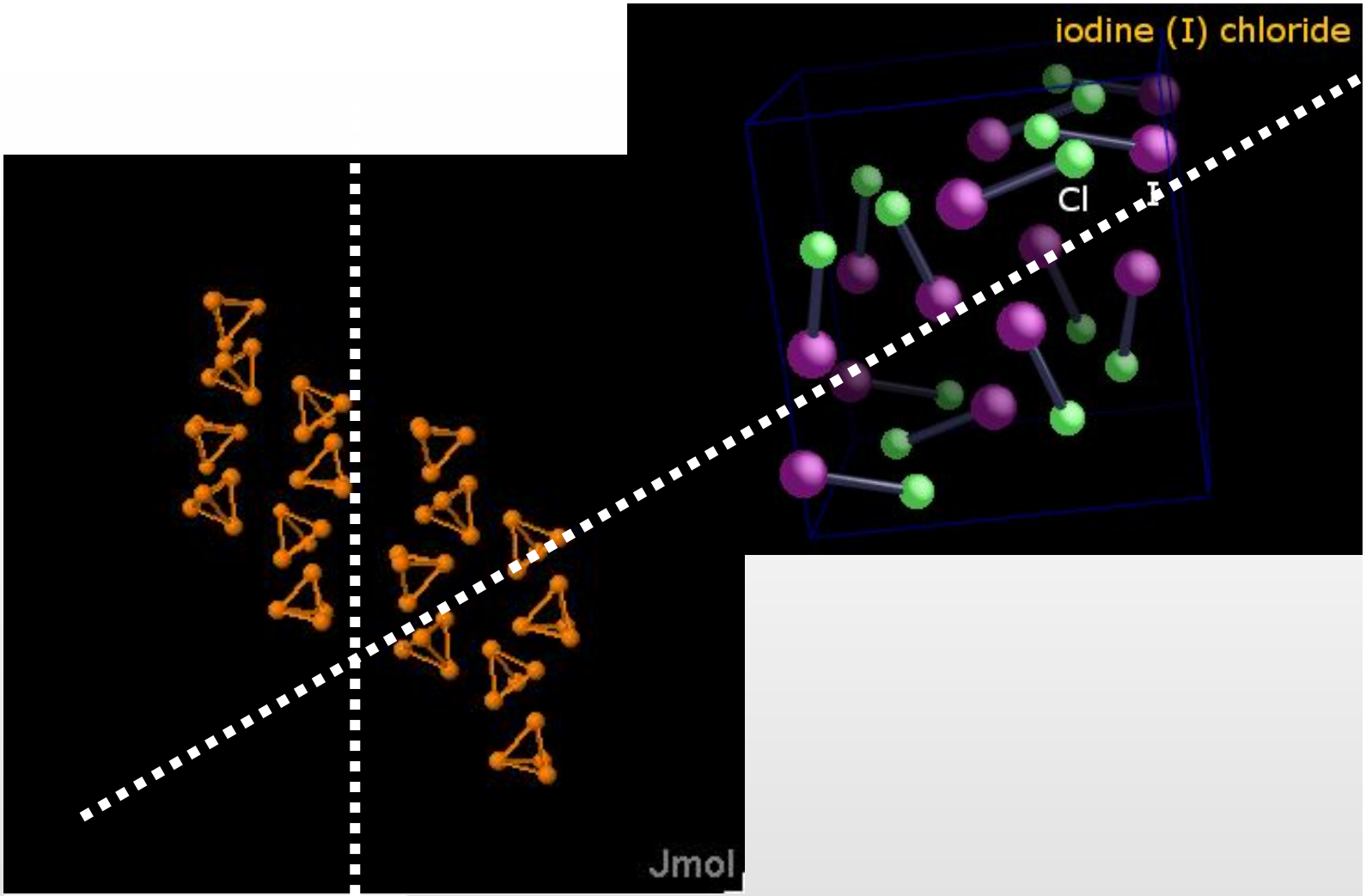
6000K

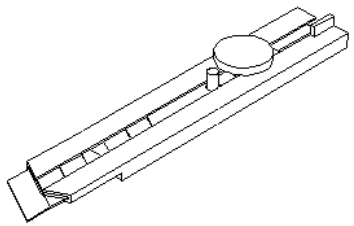


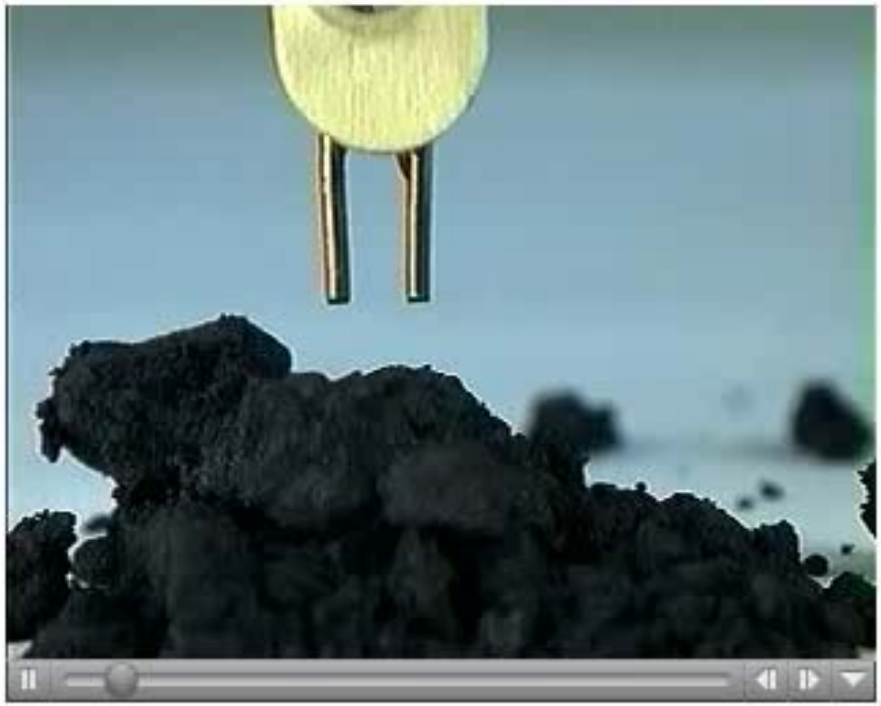
8000K



10000K


iodine (I) chloride
Cl
I
Jmol





P negro

Br_2 liquido ~Br_2 sólido

Conductores del calor

Plástico
(sólido macromolecular)

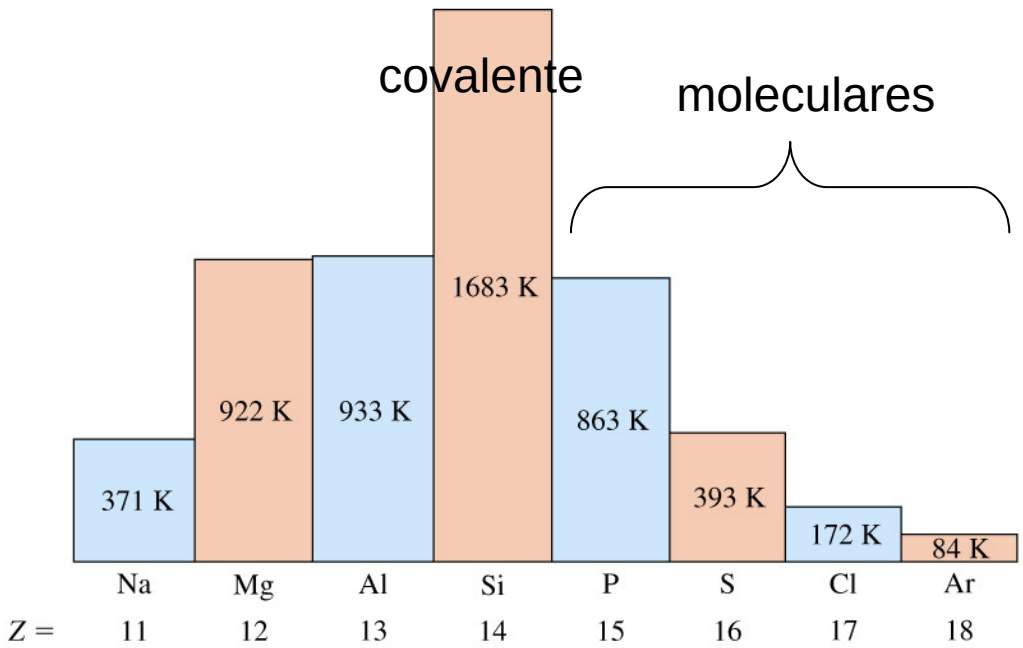
Diapositiva 31

FGA14 Metals conduct heat. Pasta is glued to rods with margarine and hot water is added to the cup. Samples from left to right are copper, aluminum, brass, iron, and plastic.

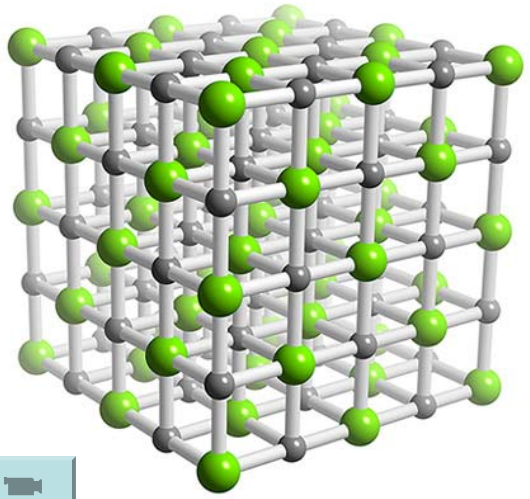
Flaviano García Alvarado; 06/09/2006

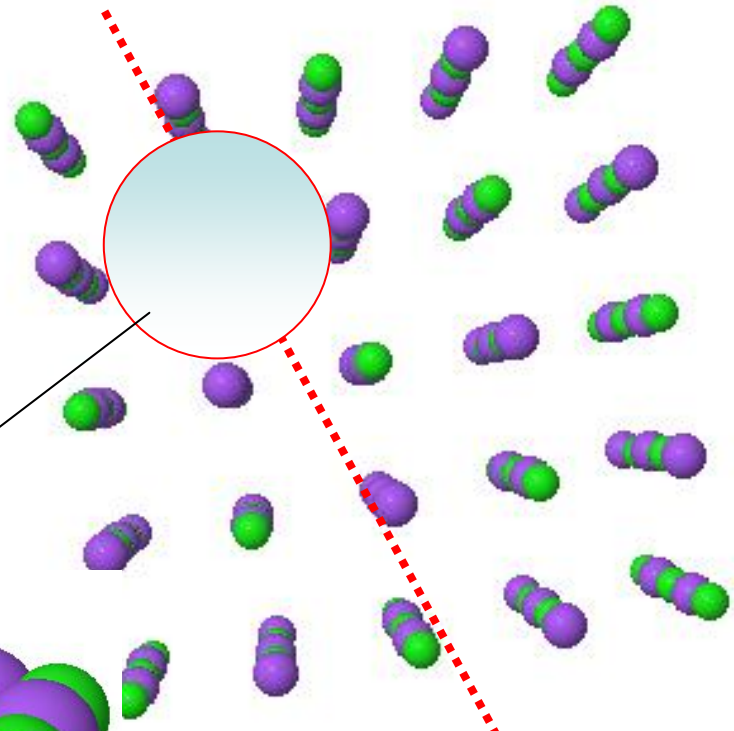
TABLE 10.6 Melting Points of Two Series of Compounds

	Molecular Mass, u	Melting Point, °C
CF_4	88.0	−183.7
CCl_4	153.8	−22.9
CBr_4	331.6	90.1
CI_4	519.6	171
HF	20.0	−83.6
HCl	36.5	−114.2
HBr	80.9	−86.8
HI	127.9	−50.8

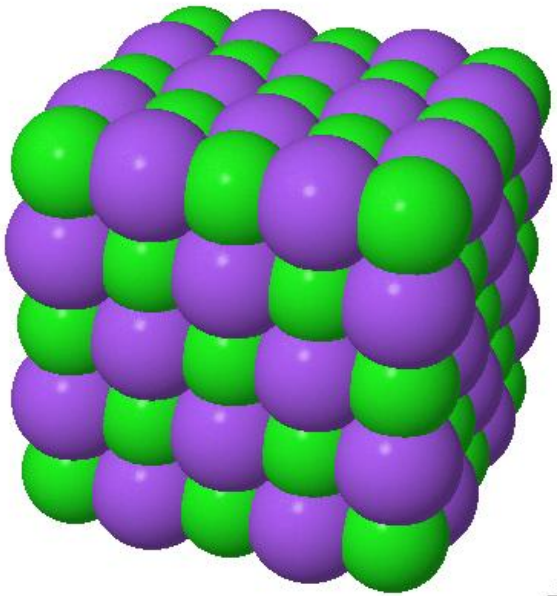


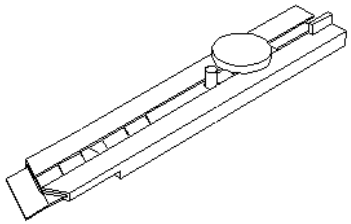
No son enlaces!!!
Enlace iónico es fuerte y no direccional

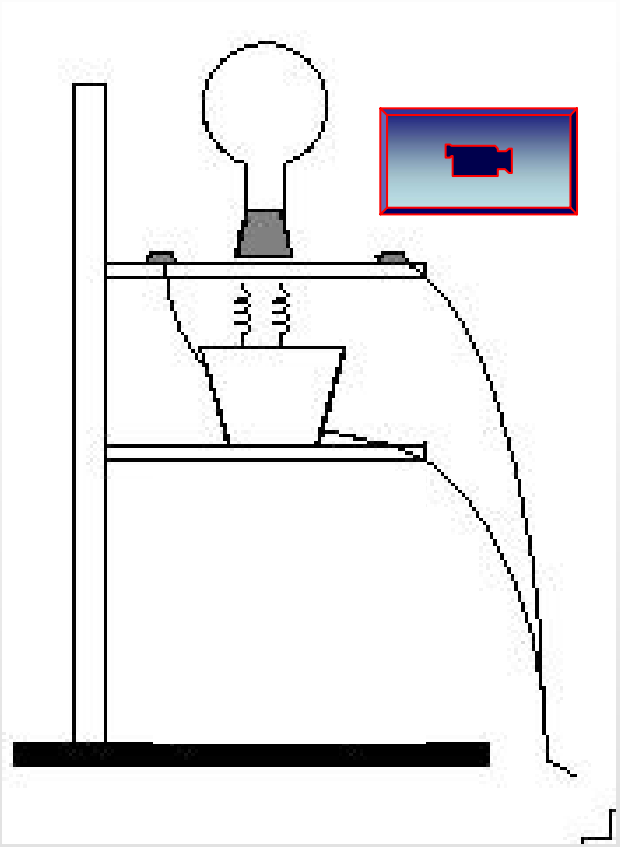


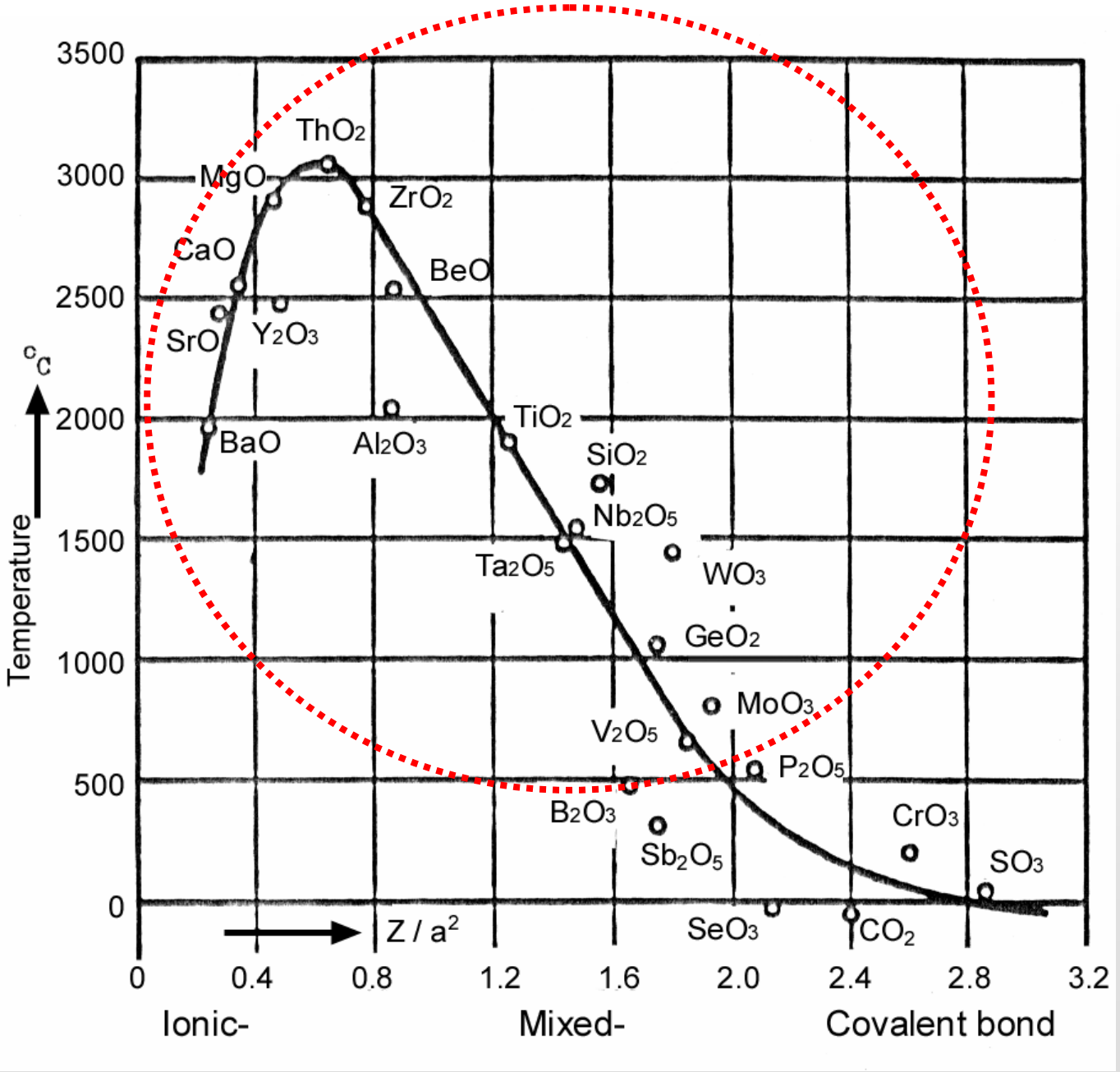


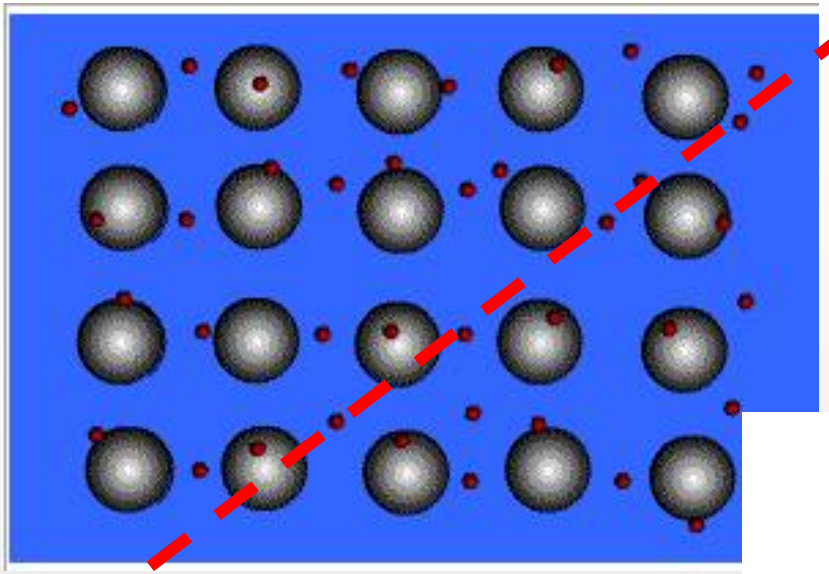
Interacción electrostática
~ “esfera”

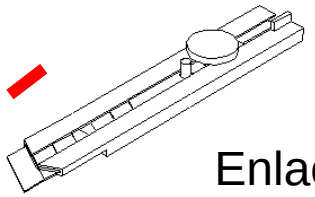







3500
3000
2500
2000
1500
1000
500
0
°C
Temperature
ThO2
MgO
ZrO2
CaO
BeO
SrO
Y2O3
BaO
Al2O3
TiO2
SiO2
Nb2O5
Ta2O5
WO3
GeO2
MoO3
V2O5
P2O5
B2O3
Sb2O5
CrO3
SO3
SeO3
CO2
Z / a2
0
0.4
0.8
1.2
1.6
2.0
2.4
2.8
3.2
Ionic-
Mixed-
Covalent bond





Enlace no direccional_

E_{enlace} <> dureza

Blandos……Duros

Li, Na…… ……W, Os

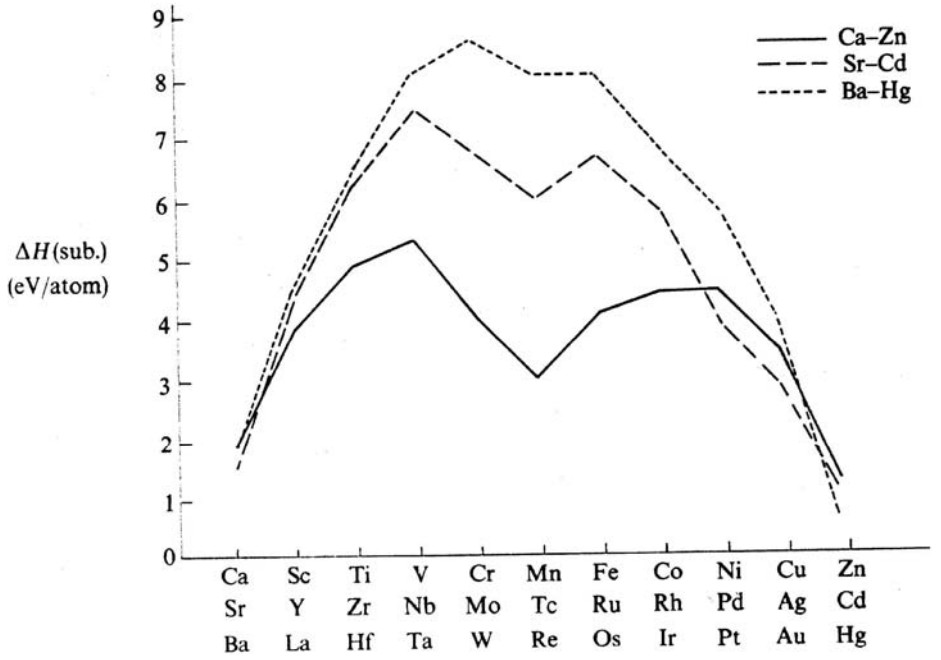
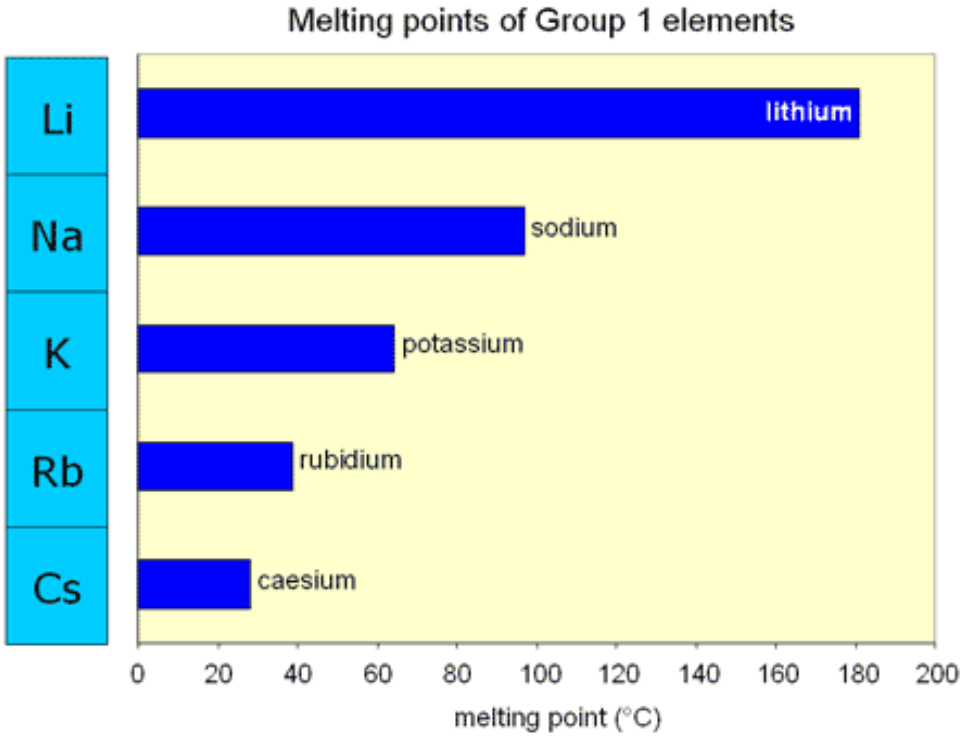


Fig. 3.14 Sublimation energies for transition metals of the three series.

Li, Na…… ……W, Os

P_F ↓……P_F ↑



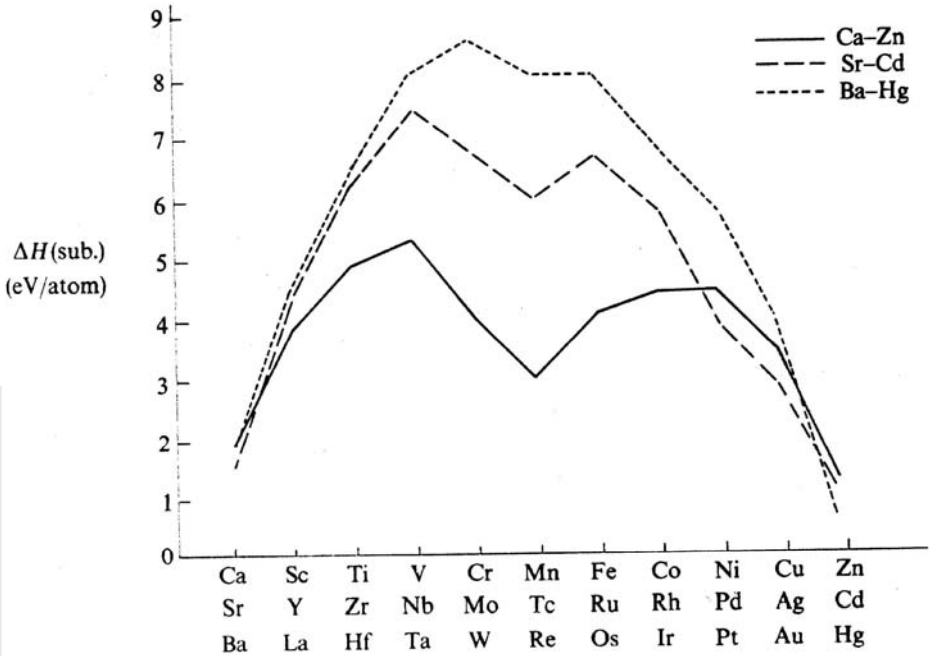
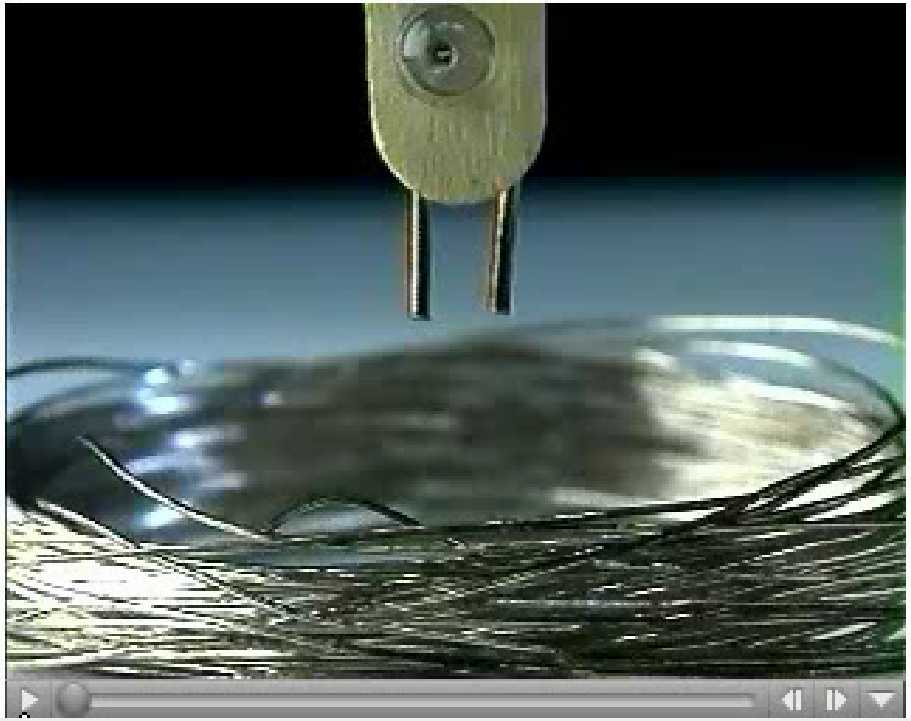


Fig. 3.14 Sublimation energies for transition metals of the three series.



Ag

Bi

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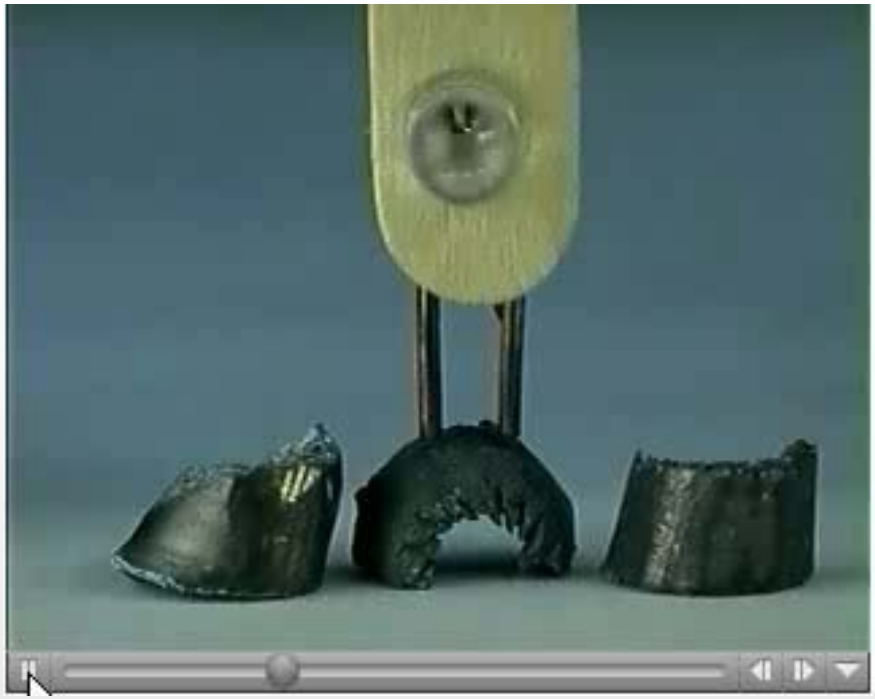
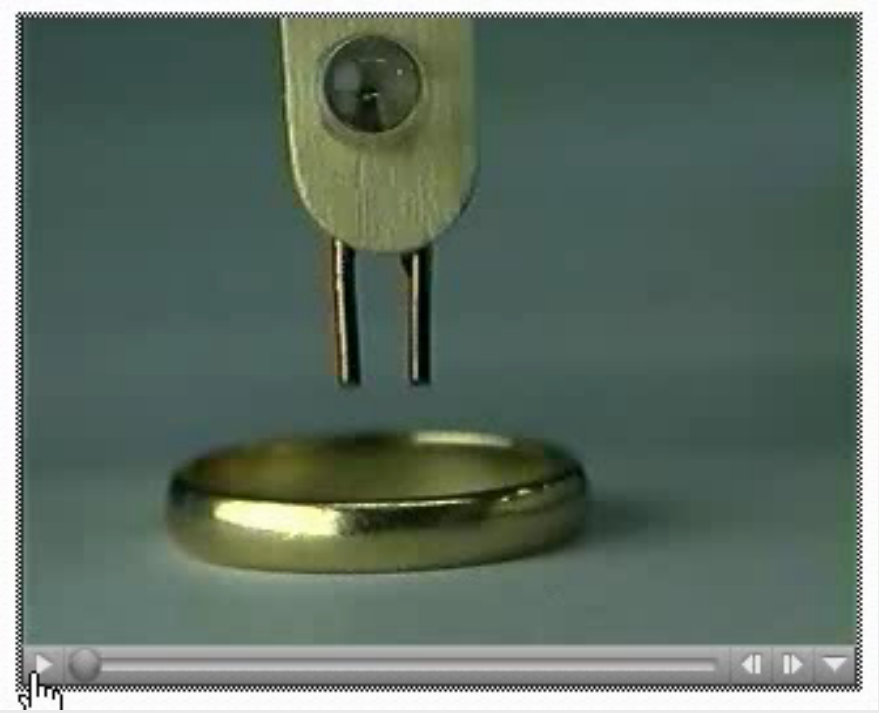
Ca



Mo

Au



Gd

Aluminio

Bronce Hierro

Cobre

Diapositiva 42

FGA16 Metals conduct heat. Pasta is glued to rods with margarine and hot water is added to the cup. Samples from left to right are copper, aluminum, brass, iron, and plastic.

Flaviano García Alvarado; 06/09/2006

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