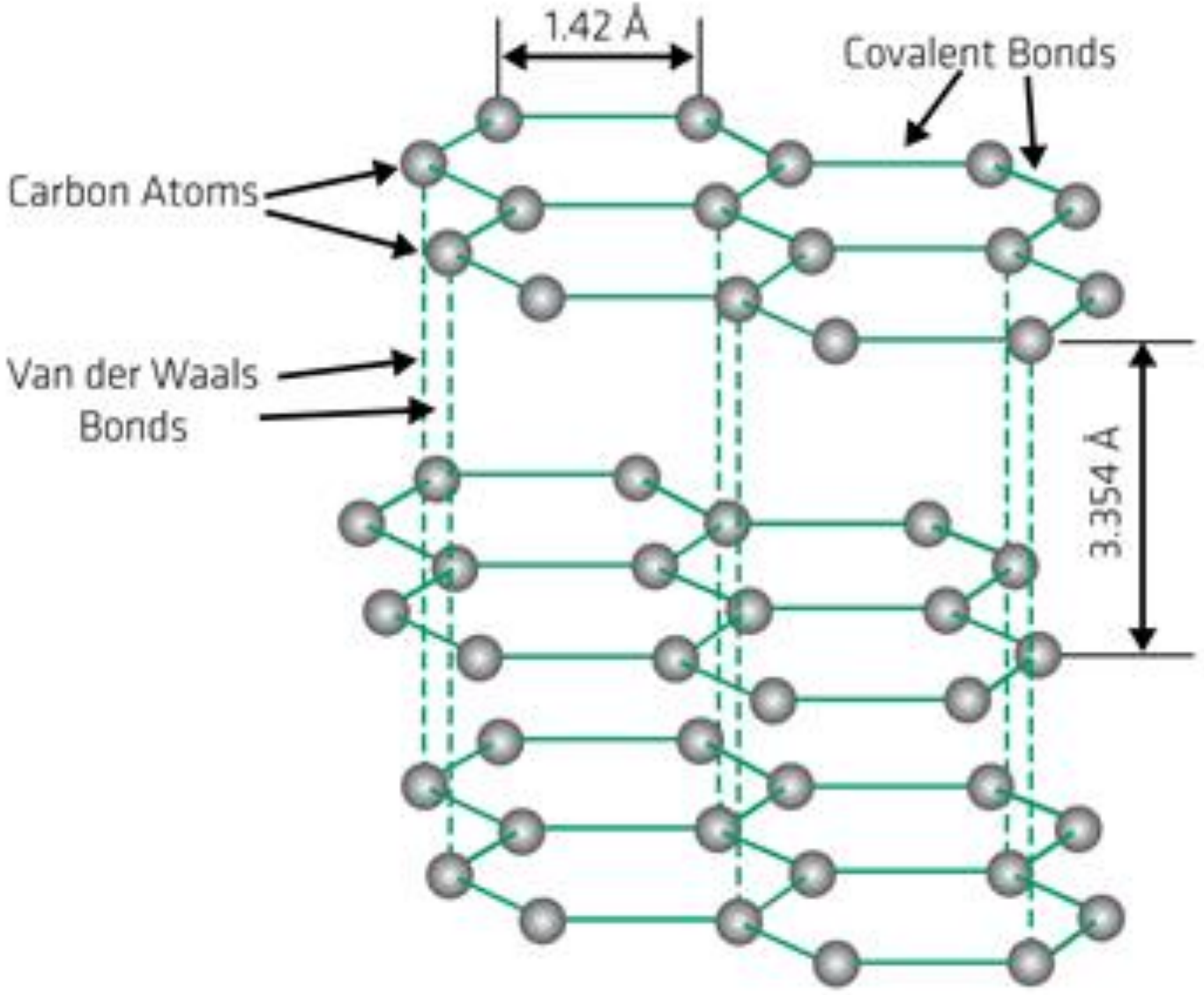
Graphite

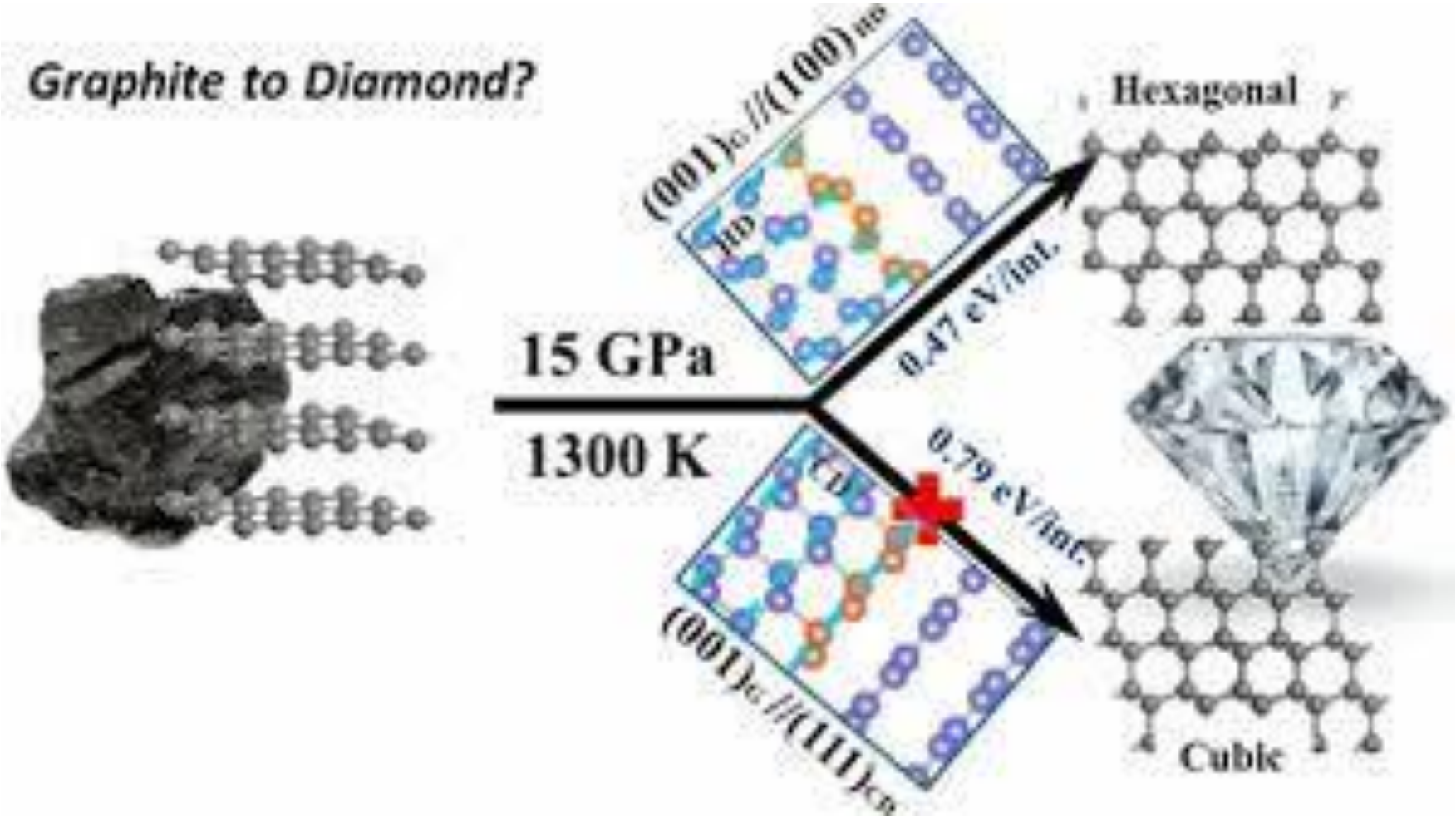
- It is an allotrope of Carbon.
- A crystalline form of carbon.
- Its atoms arranged in a hexagonal structure.
- It occurs naturally in this form.
- Under high pressures and temperatures it converts to diamond.
- Graphite is used in pencils and lubricants.
- It is a good conductor of heat and electricity.
- Its high conductivity makes it useful in electronic products such as electrodes, batteries, and solar panels.

DIAMOND

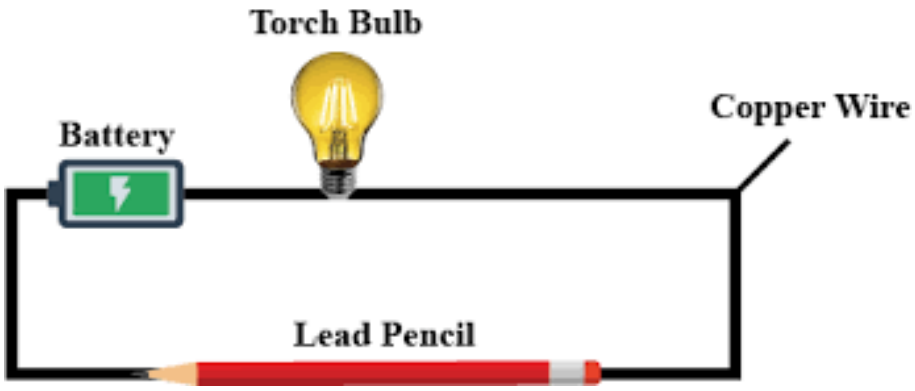
GRAPHITE

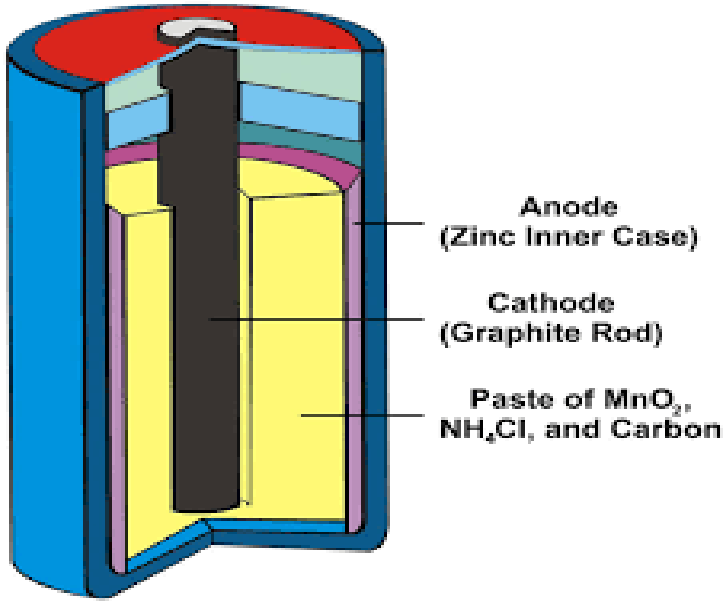
FULLERENE


1.42 Å
Covalent Bonds
Carbon Atoms
Van der Waals Bonds
3.354 Å

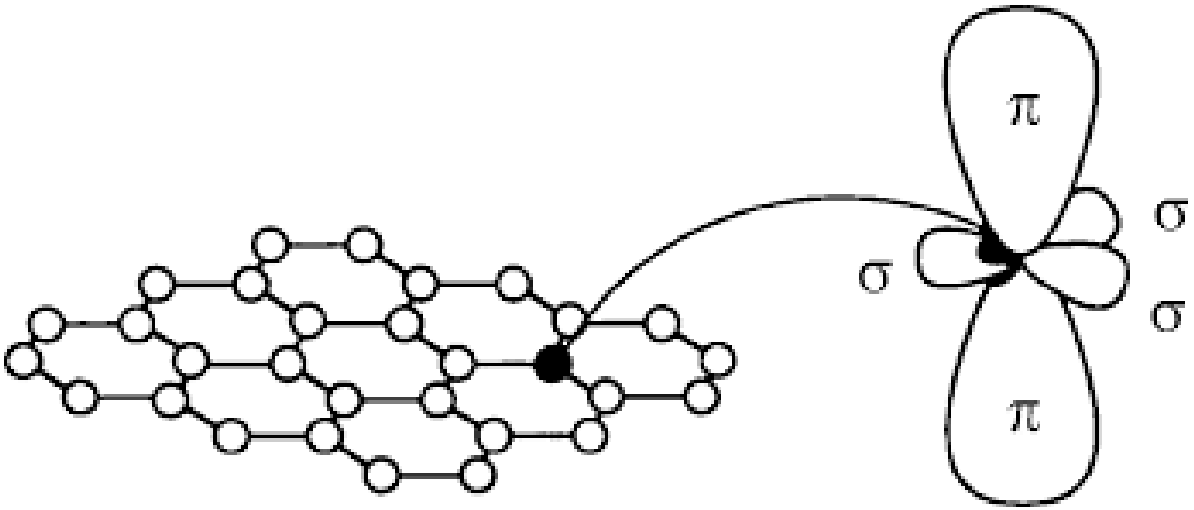

Graphite to Diamond?
15 GPa
1300 K
Hexagonal
Cubic
0.47 eV/Int.
0.79 eV/Int.


GRAPHITE POWDER
HIGH CARBON
LUBRICATING


Torch Bulb
Battery
Copper Wire
Lead Pencil

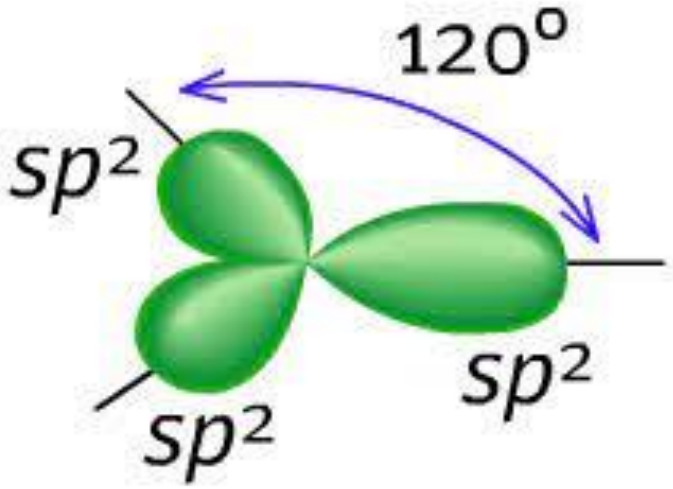

Anode
(Zinc Inner Case)
Cathode
(Graphite Rod)
Paste of MnO_2,
NH_4Cl, and Carbon

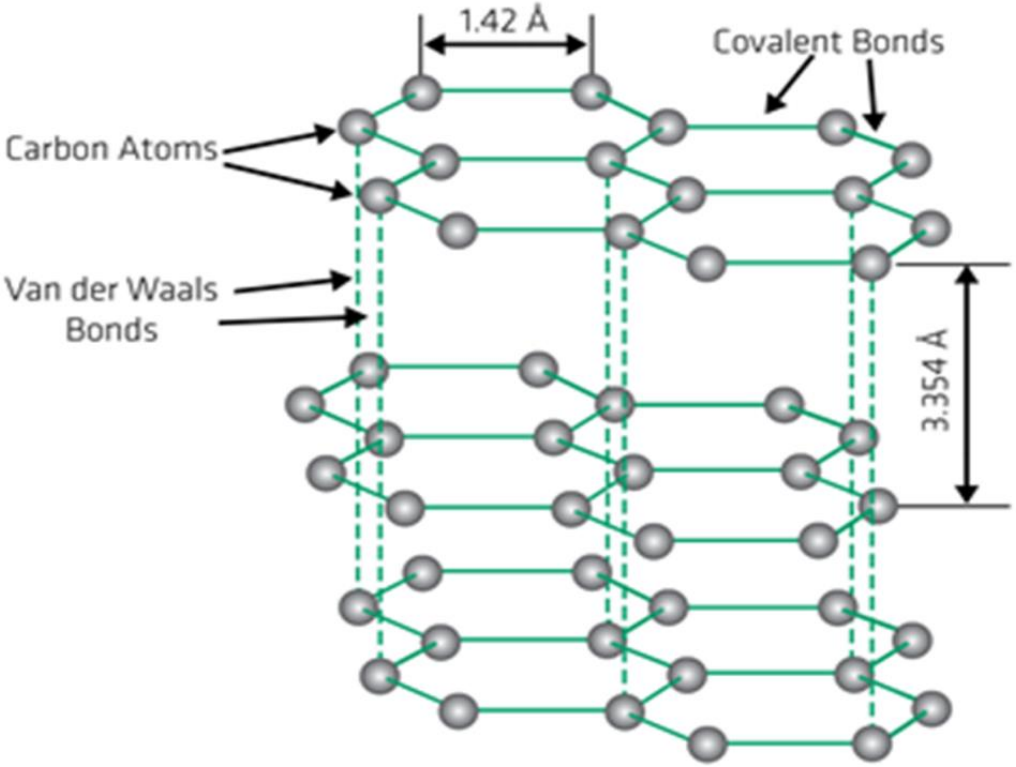
Each carbon is bonded with three more carbon atoms.



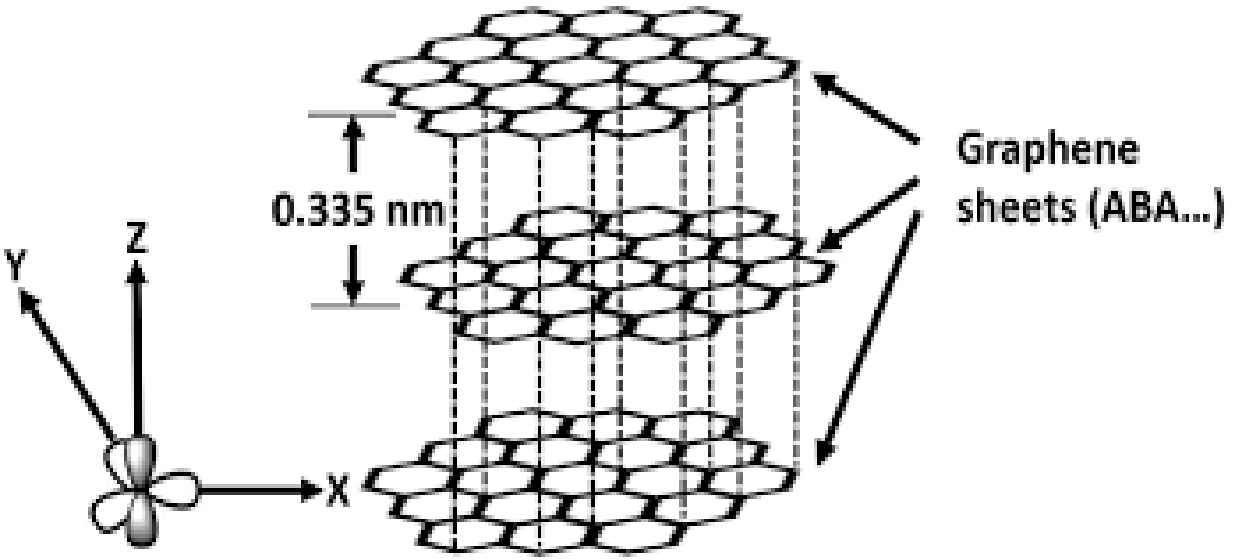
The fourth electron is free to migrate in the plane, making graphite electrically conductive.

Structure & Properties

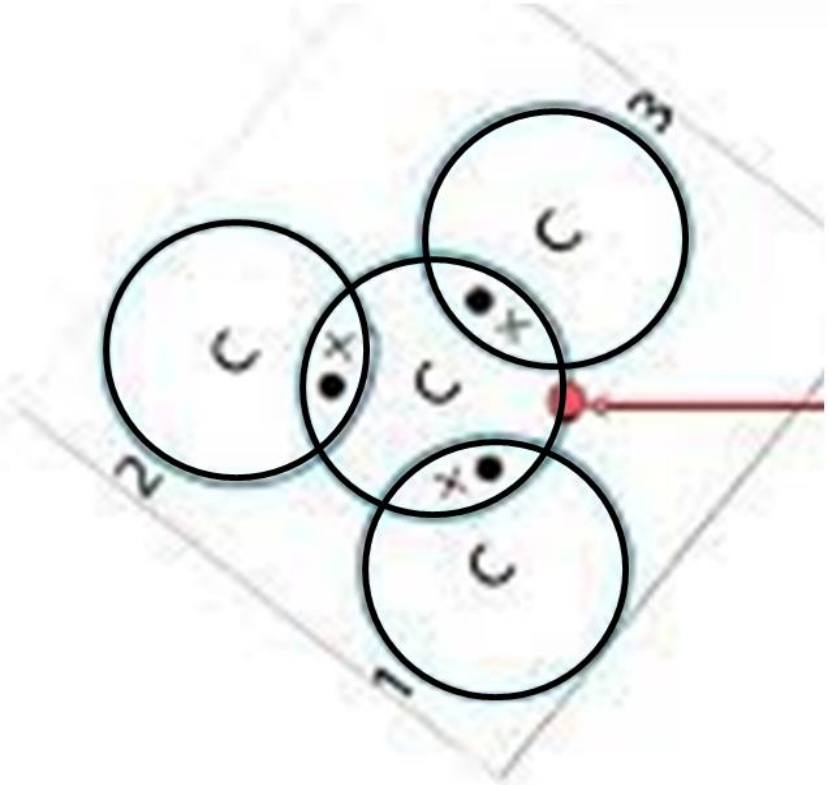




- In graphite, there is sp^2 hybridzation and hybrid orbitals are arranged in hexagonal ring.

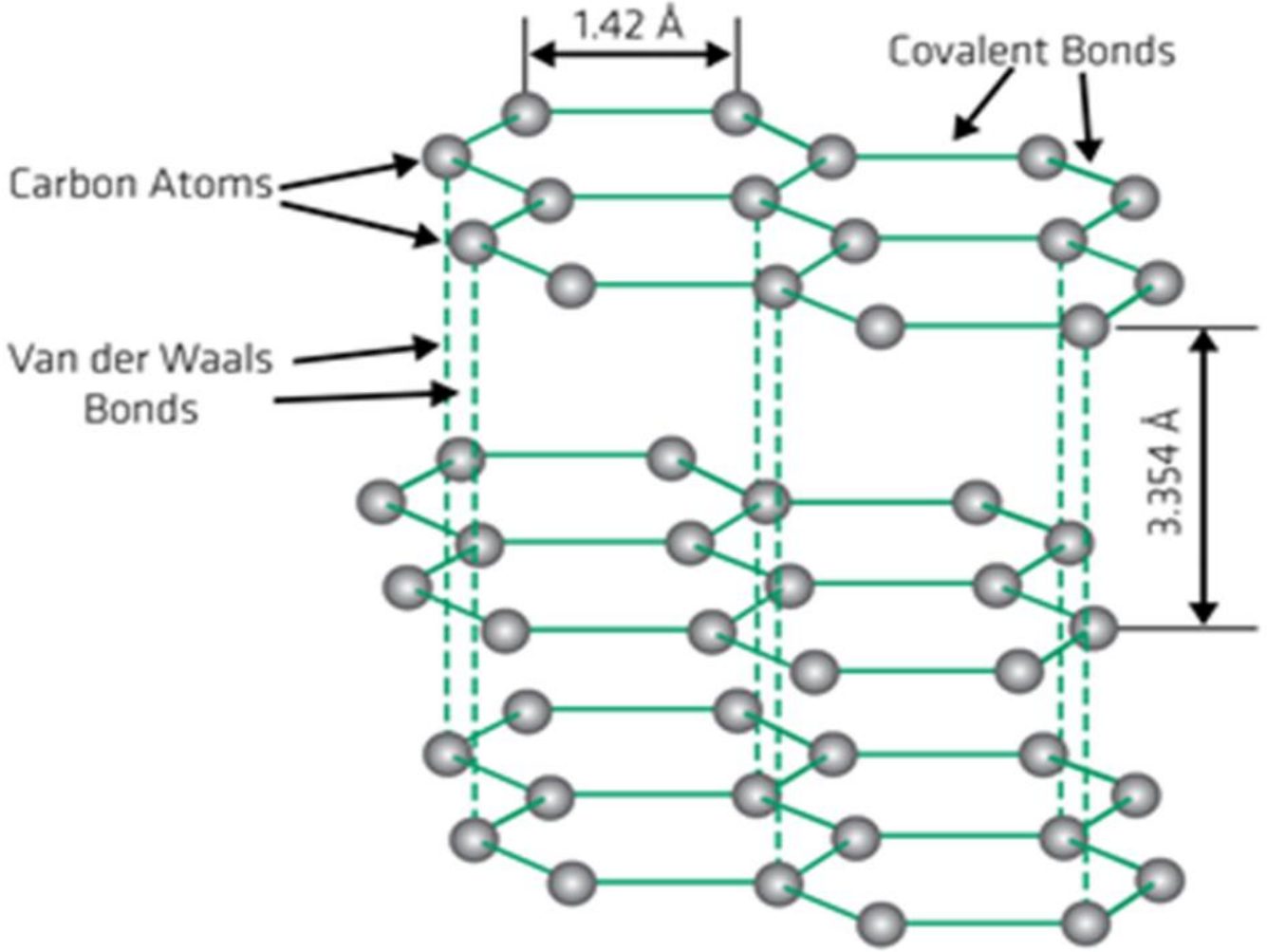

0.335 nm
Graphene
sheets (ABA...)
Y
Z
X

Why is graphite able to conduct electricity?

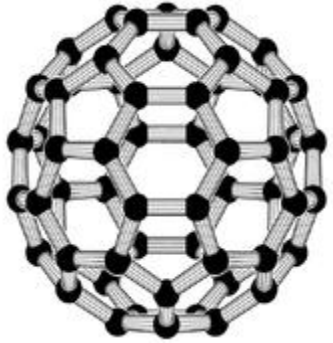


Out of four valence electrons of each carbon atom, three electrons are involved in covalent bonding with three different carbon atoms. One electron in each carbon is free to move, called as delocalized electron. That is the reason, graphite can conduct electricity.

Bonding between layers is through weak van der Waals bonds, which allow layers of graphite to slide past each other, thus it can be used as a lubricant.



Fullerene



- A fullerene is an allotrope of carbon.
- whose molecule consists of carbon atoms connected by single and double bonds.
- Closed cage like structure.
- The molecule may be a hollow sphere, ellipsoid, tube, or many other shapes and sizes.
- The family is named after buckminsterfullerene (C_{60}), the most famous member, which in turn is named after Buckminster Fuller.
- The closed fullerenes, especially C_{60}, are also called **buckyballs** or Soccer Ball

- C_{60} cluster must be a spheroidal closed cage in the form of a Truncated Icosahedron
- a polygon with 60 vertices and 32 faces,
- 12 of the faces are pentagons and 20 hexagons.
- A pentagon surrounded by hexagons

Properties

The unique molecular structure results in extraordinary macroscopic properties

- high tensile strength,
- high electrical conductivity,
- high ductility,
- high heat conductivity,
- and relative chemical inactivity

Uses

1. **In Solar Cells as acceptors:**

Because fullerene have high electron affinity and they are able to transfer electrons, they can act as acceptors in solar cells

2. **Hydrogen gas storage**

Fullerenes are able to hydrogenate and dehydrogenate easily due to presence of C=C double bond.

3. Antioxidants
4. Antiviral agents
5. Gene and drug delivery
6. Photosensitizers in photodynamic therapy

Thanks

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