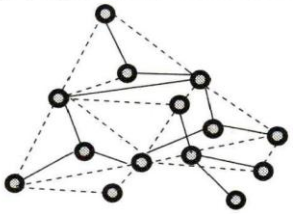
Carbon and its Different Forms

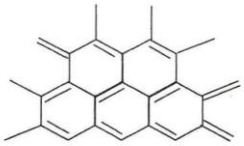
1. **Diamond :** Diamond is a big 3 dimensional polymer of carbon in which C-atoms (sp^3-hybridised) are arranged tetrahedrally by utilising their sp^3 hybrid orbitals. The C - C bond distance is 1·54Å. Each C-atoms seems to lie at the centre of a regular tetrahedron and is linked to 4 surrounding C-atoms lying at the corners of tetrahedron through strong covalent bonds as shown in figure below :



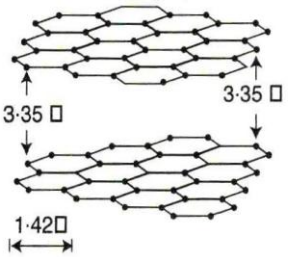
Structure of diamond

Due to high strength of covalent bonds holding numerous C-atoms together diamond is very hard and have high density. Since breaking of diamond requires breaking of strong covalent bonds, the melting point of C is unusually high (highest in the periodic table) being clase to 3500°C. It is a bad conductor of heat and electricity.

2. **Graphite :** Graphite, unlike diamond has a two dimensional structure. In this case, only 3 of the 4 valency electrons of C participate in bonding. Thus hybridisation is sp^2 having 3 covalent bonds with 3 other C-atoms in the same plane. The 4th electron of C does not participate in the bonding, remains free and is responsible for elecrical conductivity of graphite. In fact the structure of graphite is 2 dimensional, sheet like consisting a number of haxagonal rings fused togther as shown in figure below :



(a) Hexagonal layer structure of graphite



(b) Bonding in graphite

The sheet or layers are held together by relatively weak van der Waals forces. The C—C bond distance is 1·42 Å. The distance between two successive layers is 3·36 Å. This structure is less compact than that of diamond and since the bonding between layers involve only the van der Waals forces (weak forces) hence these layers can slide over each other. This gives softness, greasiness and lubricating character to graphite.

3. **Types of Coal**

Wood contains about 40% carbon. Carbonation is a very slow process and may have taken thousands of years to take place. Due to this we get different varieties of coal.

S. No.	Types of Coal	Carbon Content
1.	Peat	60% carbon
2.	Lignite (soft coal)	70% carbon
3.	Bituminous (household coal)	80% carbon
4.	Anthracite (hard coal)	90% carbon