

## Silicates.

These are the compounds with basic unit of  $(\text{SiO}_4)^{4-}$  anion in which each Si atom is linked directly to four oxygen atoms tetrahedrally. These tetrahedra link themselves by corners and never by edges. Which are of following types:

- (1) Ortho silicates: In these discrete  $\text{SiO}_4^{4-}$  tetrahedra are present and there is no sharing of oxygen atoms between adjacent tetrahedra e.g., Willamette  $(\text{Zn}_2\text{Si}_2\text{O}_4)$ , Phenacite  $(\text{Be}_2\text{SiO}_4)$ , Zircons  $(\text{ZrSiO}_4)$  and Forestrite  $(\text{Mg}_2\text{SiO}_4)$ .
- (2) Pyrosilicates: In these silicates the two tetrahedral units share one oxygen atom (corner) between them containing basic unit of  $(\text{Si}_2\text{O}_7)^{6-}$  anion e.g., Thortveitite  $(\text{Sc}_2\text{Si}_2\text{O}_7)$  and Hemimorphite  $\text{Zn}_3\text{Si}_2\text{O}_7\text{Zn}(\text{OH})_2\text{H}_2\text{O}$
- (3) Cyclic or ring silicates : In these silicates the two tetrahedral unit share two oxygen atoms (two corners) per tetrahedron to form a closed ring containing basic unit of  $(\text{SiO}_3)_n^{2n-}$  e.g., Beryl  $(\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18})$  and Wollastonite  $(\text{Ca}_3\text{Si}_3\text{O}_9)$ .
- (4) Chain silicates: The sharing of two oxygen atoms (two corners) per tetrahedron leads to the formation of a long chain e.g., pyroxenes and Asbestos  $\text{CaMg}_3\text{O}(\text{Si}_4\text{O}_{11})$  and Spodumene  $\text{LiAl}(\text{Si}_2\text{O}_6)$ .
- (5) Sheet silicates: In these silicates sharing of three oxygen atoms (three corners) by each tetrahedron unit results in an infinite two dimensional sheet of primary unit  $(\text{Si}_2\text{O}_5)_n^{2n-}$ . The sheets are held together by electrostatic force of the cations that lie between them e.g.,  $[\text{Mg}_3(\text{OH})_2(\text{Si}_4\text{O}_{10})]$  and Kaolin,  $\text{Al}_2(\text{OH})_4(\text{Si}_2\text{O}_5)$ .
- (6) Three dimensional or frame work silicates: In these silicates all the four oxygen atoms (four corners) of  $(\text{SiO}_4)^{4-}$  tetrahedra are shared with other tetrahedra, resulting in a three dimensional network with the general formula  $(\text{SiO}_2)_n$  e.g., Zeolites, Quartz.

### Important Tips

Beckmann thermometer: Cannot be used to measure temperature. It is used only for the measurement of small differences in temperatures. It can and correctly up to 0.01o

Anisotropic behavior of graphite : The thermal and electrical conductivities of graphite along the two perpendicular axis in the plane containing the hexagonal rings is 100 times more than at right angle to this plane.

Effect of pressure on melting point of ice: At high pressure, several modifications of ice are formed. Ordinary ice is ice –I. The stable high pressure modifications of ice are designated as ice –II, ice – III, ice- V, ice – VI and ice – VII. When ice –I is compressed, its melting point decreases, reaching  $-22^{\circ}\text{C}$  at a pressure of about 2240 atm. A further increase in pressure transforms ice – I into ice – IIIs whose melting point increases with pressure. Ice- VII, the extreme high-pressure modification, melts to form water at about  $100^{\circ}\text{C}$  and 20,000 atm pressure. The existence of ice-IV has not been confirmed.

Isotropic: The substances which show same properties in all directions.

Anisotropic: Magnitude of some of the physical properties such as refractive index, coefficient of thermal expansion, electrical and thermal conductivities etc. is different in different directions, with in the crystal

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