

Coordination Number

It is the number of nearest neighbours of a particles.

(i) Close packing in one dimension



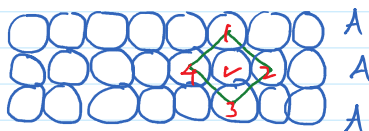
i) There is only one way of arranging spheres in a one dimensional close packed structure i.e. to arrange them in a row touching each other.

ii) In one dimensional close packed structure, coordination number is 2.

(ii) Close packing in two dimensions

Rows of one dimensional close packed spheres may be stacked in the following two different ways to give close packing in two dimensions:

First way



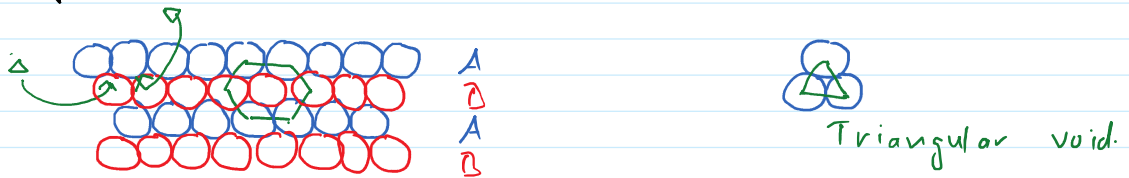
i) The spheres of the second row are exactly above those of the first row i.e. the spheres of the two rows are aligned horizontally as well as vertically.

ii) Let us call the first row as 'A' type row, the second row is exactly the same as the first one, is also of 'A' type. Similarly, we may place more rows to obtain AAA type of arrangement.

iii) In this type of packing the coordination number is 4. Hence

this packing is called square close packing in two dimensions. If the centres of these 4 immediate neighbouring spheres are joined, a square is formed.

Second way:



- i) Place the second row above the first one to fit its spheres in the depressions of the first row.
- ii) If the arrangement of spheres in the first row is called 'A' type, the one in the second row is different and may be called 'B' type. When the third row is placed adjacent to the second in similar manner, its spheres are aligned with those of the first layer. Hence this layer is also of 'A' type. The spheres of similarly placed fourth row will be aligned with those of the second row ('B' type). Hence this arrangement is of ABAB... type.
- iii) In this arrangement packing efficiency is more than the square close packing.
- iv) The centres of the six spheres around a sphere, when joined, form a hexagon. Hence this type of packing is called hexagonal close packing. The coordination number is 6.
- v) There are two types of triangular shaped voids (empty spaces). In one row, the apex of the triangles are pointing upwards and in the next layer downwards.