

# Chapter Three

# Crystal Binding

## 3.4 Some Important Interaction

### (a) Covalent Bond

The covalent Bond is the classical electron pair or homopolar bond of chemistry. It is strong bond. It is strong directional property. So carbon, silicon and germanium have the Diamond structure with atoms joined to four nearest neighbours at tetrahedral angle.

Covalent bond is usually formed from two electrons, one from each atom participating in the bond. The electrons forming the bond tend to be partly localised in the region between the two atoms joined by the bond. The spin of the two electrons in the bond are anti parallel. Spin dependent coulomb energy is called exchange interaction.

### (b) Metallic bond

In most cases, the outermost electron shell of each of the metal atoms overlaps with a large number of neighbouring atoms. As a consequence, the valence electrons continually move from one atom to another and are not associated with any specific pair of atoms. In short, the

Valence electrons in metals, unlike those in covalently bonded substances, are nonlocalized, capable of wandering relatively freely throughout the entire crystal. The atoms that the electrons leave behind become positive ions, and the interaction between such ions and valence electrons gives rise to the cohesive or binding force that holds the metallic crystal together. Electric conductivity malleability and ductility and other properties of metals can be explained by non-directionality of metallic bond and non-localised nature of electrons.

### **(c) Hydrogen Bond**

Because neutral hydrogen has only one electrons, it should form a covalent bond with only one other atom. It is known under certain condition atom of hydrogen atom attracted by rather stronger force to two atom, thus forming hydrogen bond. It is believed that hydrogen bond is ionic in nature being formed only between the most electro negative atoms. Particularly F, O, and N. in extreme ionic form of the hydrogen bond, the hydrogen atom loses its electron to another atom in molecule ,the bare proton form hydrogen bond.