

Polar Bond Encyclopedia Article

Polar Bond

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Polar Bond

The combination of forces that holds two atoms in a fixed relationship within a **molecule** is called a chemical or molecular bond.

In 1916, **Gilbert Newton Lewis** proposed that covalent bonds are formed by the sharing of electrons between the bonded atoms. Quantum mechanics later affirmed the shared paired **covalent bond**, providing a theoretical basis for Lewis' proposal.

In the quantum mechanical interpretation of the covalent bond, atomic orbitals on each **atom** overlap, forming a molecular orbital that stretches over both nuclei and is occupied by two electrons, one from each of the two bonded atoms. When these two atoms have the same **electronegativity** (i.e. the ability to attract electrons from other atoms), the resulting bond is purely covalent: the shared electrons are equally attracted to and shared by both nuclei. When, however, the bonded atoms have different electronegativities, the atom with the greater attraction for electrons pulls the shared electrons toward itself, away from the less electronegative atom. The shared electrons, therefore, spend more time in the vicinity of the more electronegative atom, and as a consequence, it possesses a partial negative charge. The less electronegative atom has a partial positive charge since the shared electrons spend less time near it. There is, therefore, a separation of charges in the bond, with a partial positive charge at one end of the bond and a partial negative charge at the other. Such a bond is called a polar covalent bond.

In the extreme case, when the electronegativity differences of the bonded atoms are quite large, the less electronegative atom loses control of its **electron** to the more electronegative atom and becomes a positive **ion**. The more electronegative atom, now in complete possession of the electrons, becomes a negative ion, and purely electrostatic forces hold the two together in an **ionic bond**.