

CHEMICAL BONDS

A chemical bond is the association of atoms or ions to form molecules, crystals, and other structures. The bond may result from the electrostatic force between oppositely charged ions as in ionic bonds or through the sharing of electrons as in covalent bonds, or some combination of these effects. Chemical bonds are described as having different strengths: there are "strong bonds" or "primary bonds" such as covalent, ionic and metallic bonds, and "weak bonds" or "secondary bonds" such as dipole–dipole interactions, the London dispersion force, and hydrogen bonding.

Since opposite electric charges attract, the negatively charged electrons surrounding the nucleus and the positively charged protons within a nucleus attract each other. Electrons shared between two nuclei will be attracted to both of them. "Constructive quantum mechanical wavefunction interference" stabilizes the paired nuclei (see Theories of chemical bonding). Bonded nuclei maintain an optimal distance (the bond distance) balancing attractive and repulsive effects explained quantitatively by quantum theory.

The atoms in molecules, crystals, metals and other forms of matter are held together by chemical bonds, which determine the structure and properties of matter.

All bonds can be described by quantum theory, but, in practice, simplified rules and other theories allow chemists to predict the strength, directionality, and polarity of bonds. The octet rule and VSEPR theory are examples. More sophisticated theories are valence bond theory, which includes orbital hybridization and resonance, and molecular orbital theory which includes the linear combination of atomic orbitals and ligand field theory. Electrostatics are used to describe bond polarities and the effects they have on chemical substances.