What Is Ionic Bonding

Typical members of these classes have distinctive electron distributions, 574b0a32c1

Valence bond theory Both Lewis and Kossel based their bonding models on Abegg's rule (1904) that the difference In chemistry, valence bond (VB) theory is one of the two basic theories, along with molecular orbital (MO) theory, that were developed to use the methods of quantum mechanics to describe chemical bonding. It focuses on how the atomic orbitals of the dissociated atoms combine to give individual chemical bonds when a molecule is formed. transfers of electrons between atoms, a model of ionic bonding. In contrast, molecular orbital theory has orbitals that cover the whole molecule 574b0a32c1

Bonding in solids The traditional classification distinguishes four kinds of bonding:. "covalent solids") Ionic bonding, which forms ionic solids Metallic bonding, which forms metallic solids Weak inter molecular bonding, which forms molecular Solids can be classified according to the nature of the bonding between their atomic or molecular components 574b0a32c1

The component ions in a salt can be either inorganic, such as chloride (Cl−), or organic, such as acetate (CH3COO−). Each ion can be either monatomic, such as sodium (Na+) and chloride (Cl−) in sodium chloride, or polyatomic, such as ammonium (NH+4) and carbonate (CO2−3) ions in ammonium carbonate. Salts containing basic ions hydroxide (OH−) or oxide (O2−) are classified as bases, such as sodium hydroxide and potassium oxide. 574b0a32c1

Bond valence method 3, the resulting average bond valence is known as the bonding strength of the atom. This model is a development of Pauling's rules. number is used in Eq. Since the bonding strength of an atom is the valence The bond valence method or mean method (or bond valence sum) (not to be mistaken for the valence bond theory in quantum chemistry) is a popular method in coordination chemistry to estimate the oxidation states of atoms. It is derived from the bond valence model, which is a simple yet robust model for validating chemical structures with localized bonds or used to predict some of their properties 574b0a32c1

Ionic bonding, which forms ionic solids 574b0a32c1 Individual ions within a salt usually have multiple near neighbours, so they

are not considered to be part of molecules, but instead part of a continuous three-dimensional network. Salts usually form crystalline structures when solid. 574b0a32c1 Weak inter molecular bonding, which forms molecular solids (sometimes anomalously called "covalent solids") 574b0a32c1 == Method == 574b0a32c1 Covalent bonding, which forms network covalent solids (sometimes called simply "covalent solids") 574b0a32c1 An example where charge shift bonding has been used to explain the low electron density found experimentally is in the central bond between the inverted tetrahedral carbon atoms in [1.1.1]propellanes. Theoretical calculations on a range of molecules have indicated that a charge shift bond is present, a striking example being fluorine, F2, which is normally described as having a typical covalent bond. The charge shift bond (CSB) has also been shown to exist at the cation-anion interface of protic ionic... 574b0a32c1 The term "hydrogen bond" is generally used for well-defined, localized interactions with significant charge transfer... 574b0a32c1 == Electronegativity and bond strength == 574b0a32c1 Salts composed of small ions typically have high melting and boiling points, and are hard and brittle. As solids they are almost always electrically insulating, but when melted or dissolved they become highly conductive, because the... 574b0a32c1 == History... == 574b0a32c1 Metallic bonding is not the only type of chemical bonding a metal can exhibit as a pure substance. For example, elemental gallium consists of covalently-bound pairs of atoms in both liquid and solid-state—these pairs form a crystal structure with metallic bonding between them. Another example of a metal–metal covalent bond is the mercurous ion (Hg2+2). 574b0a32c1 Metallic bonding, which forms metallic solids 574b0a32c1

Carbon–fluorine bond (after the B–F single bond, Si–F single bond, and H–F single bond), and relatively short, due to its partial ionic character. It is one of the strongest single bonds in chemistry (after the B–F single bond, Si–F single bond, and H–F single bond), and relatively short, due to its partial ionic character. The bond also strengthens and shortens as more fluorines are added to the same carbon on a chemical compound. For this reason, fluoroalkanes like tetrafluoromethane (carbon tetrafluoride) are some of the most unreactive organic compounds. The bond also strengthens and The carbon–fluorine bond is a polar covalent bond between carbon and fluorine that is a component of all organofluorine compounds 574b0a32c1

The basic method is that the valence V of an atom is the sum of the individual bond valences vi surrounding the atom: 574b0a32c1 In 1921 the chemist Charles Rugeley Bury suggested that eight and

eighteen electrons in a shell form stable configurations... 574b0a32c1 Ionic potential 574b0a32c1

Charge-shift bond It has long been known from experiment that the accumulation of electric charge between the bonded atoms is not necessarily a feature of covalent bonds. A feature of the charge shift bond is that the predicted electron density between the bonded atoms is low. The charge shift bond derives its stability from the resonance of ionic forms rather than the covalent sharing of electrons which are often depicted as having electron density between the bonded atoms. the charge-shift bond is a proposed new class of chemical bonds that sits alongside the three familiar families of covalent, ionic, and metallic bonds In theoretical chemistry, the charge-shift bond is a proposed new class of chemical bonds that sits alongside the three familiar families of covalent, ionic, and metallic bonds where electrons are shared or transferred respectively 574b0a32c1

Salt (chemistry) In chemistry, a salt or ionic compound is a chemical compound consisting of an assembly of positively charged ions (cations) and negatively charged ions In chemistry, a salt or ionic compound is a chemical compound consisting of an assembly of positively charged ions (cations) and negatively charged ions (anions), which results in a compound with no net electric charge. The constituent ions are held together by electrostatic forces termed ionic bonds 574b0a32c1

The high electronegativity of fluorine (4.0 for fluorine vs. 2.5 for carbon) gives the carbon–fluorine bond a significant polarity or dipole moment. The electron density is concentrated around the fluorine, leaving the carbon relatively electron poor. This introduces ionic character to the bond through partial charges (Cδ+—Fδ−). The partial charges on the fluorine and carbon are attractive, contributing to the unusual bond strength of the carbon–fluorine bond. The bond is labeled as "the strongest in organic chemistry," because fluorine forms the strongest single bond to carbon. Carbon–fluorine bonds can... 574b0a32c1 == History == 574b0a32c1

Chemical bond The bond may result from the electrostatic force between oppositely charged ions, as in ionic bonds; the sharing of electrons, as in covalent bonds; or some combination of these effects. Ionic charges are commonly between −3e to +3e. Ionic bonding commonly A chemical bond is the association of atoms or ions to form molecules, crystals, and other structures. 7 is likely to be covalent. Ionic bonding leads to separate positive and negative ions. 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 bonds 574b0a32c1

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) that balances attractive and repulsive effects, as explained quantitatively by quantum theory. 574b0a32c1

Ionic potential Ionic potential = electrical charge ionic radius = z r {\displaystyle Ionic potential is the ratio of the electrical charge (z) to the radius (r) of an ion. Ionic potential is the ratio of the electrical charge (z) to the radius (r) of an ion 574b0a32c1

Hydrogen bond Hydrogen bonding plays a fundamental role in chemistry, biology, and materials science. It is responsible for the anomalously In chemistry, a hydrogen bond (H-bond) is a specific type of molecular interaction that exhibits partial covalent character and cannot be described as a purely electrostatic force. Unlike simple dipole–dipole interactions, hydrogen bonding arises from charge transfer (nB → σ*AH), orbital interactions, and quantum mechanical delocalization, making it a resonance-assisted interaction rather than a mere electrostatic attraction. weaker than covalent or ionic bonds. It occurs when a hydrogen (H) atom, covalently bonded to a more electronegative donor atom or group (Dn), interacts with another electronegative atom bearing a lone pair of electrons—the hydrogen bond acceptor (Ac) 574b0a32c1

thermodynamic, electronic, and mechanical properties. In particular, the binding energies of these interactions vary widely. Bonding in solids can be of mixed or intermediate kinds, however, hence not all solids have the typical properties of a particular class, and some can be described as intermediate forms. 574b0a32c1 The general notation for hydrogen bonding is Dn−H···Ac, where the solid line represents a polar covalent bond, and the three dots indicate the hydrogen bond. Hydrogen bond donors have a protic hydrogen attached to an electronegative atom such as nitrogen (N), oxygen (O), and fluorine (F). Hydrogen bond acceptors have a lone pair of electrons, such as the nitrogen atom of amines and amides and the oxygen atom of carboxylates and water. 574b0a32c1 In 1916, G. N. Lewis proposed that a chemical bond forms by the interaction of two shared bonding

electrons, with the representation of molecules as Lewis structures. In 1916, Walther Kossel put forth his theory of the ionic chemical bond (octet rule), also independently advanced in the same year by Gilbert N. Lewis. Kossel put forward a theory similar to that of Lewis theory, except that Kossel supposed complete transfers of electrons between atoms, a model of ionic bonding. Both Lewis and Kossel based their bonding models on Abegg's rule (1904) that the difference between the maximum positive and negative valences of an element is frequently eight. 574b0a32c1

Metallic bonding It may be described as the sharing of free electrons among a structure of positively charged ions, and as a more delocalized version of covalent bonding. Metallic bonding is a type of chemical bonding that arises from the electrostatic attractive force between conduction electrons (in the form of an electron Metallic bonding is a type of chemical bonding that arises from the electrostatic attractive force between conduction electrons (in the form of an electron cloud of delocalized electrons) and positively charged metal ions. Metal atoms lose their valence electrons to a large, delocalized orbital, which leaves the nucleus, and other electrons that are closer to the nucleus, as positively charged cations. Metallic bonding accounts for many physical properties of metals, such as strength, ductility, thermal and electrical resistivity and conductivity, opacity, and lustre. The ions form a crystal lattice as they are held together by the negative charge of the delocalized orbital 574b0a32c1

The atoms in molecules, crystals, metals, and other forms of matter are held together by chemical bonds, which determine... 574b0a32c1

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