Chemistry chemistry

CHEMISTRY QUESTIONS Presented Intramolecular forces operate within the molecules or fundamental units of a substance. This would include the attraction between positive and negative ions in a crystal of an ionic compound, the covalent bonds in a molecular substance as well as the covalent bonds linking atoms in a network structure, such as that of carbon (diamond). Metallic bonds are also classified as intramolecular forces (Frederick, 1979, P. 63)Intermolecular forces operate between, rather than within, the molecules of a covalent substance. This would include the attractions exerted by one molecule of a molecular substance on another, such as the force of attraction between water molecules in ice , the attractions between atoms of the noble gas elements, Helium through Radon, attractions between molecules of one substance and molecules of another, as when two liquids are mixed, or a molecular solid such as sugar is dissolved in a liquid and the attraction between molecules of one substance and ions of another, as when an ionic compound dissolves in a liquid. (Frederick, 1979, P. 67)Intramolecular forces are much stronger than intermolecular forces hence the generally higher Melting and Boiling points associated with substances that have intramolecular forces. Aluminium, being a metal would be expected to form an ionic bond with Chlorine, which is a gaseous non-metal. This is not the case however due to the very small size of the Aluminium atom, which makes the Aluminium nucleus to exert very high attractive forces on its outer electrons, making it difficult for the atom to loose electrons in order to form ionic bonds. In Aluminium Chloride, the Aluminium atom bonds to three chlorine atoms covalently by having a shared electron with each one of the chlorine atoms. (Frederick, 1979, P. 73)Aluminium chloride exists as a dimer (Al2Cl6). The bonding between the two molecules is co-ordinate, using lone pairs on the Chlorine atoms. (Frederick, 1979, P. 75)

Magnesium has the electronic structure 1s22s22p63s2. When Magnesium atoms come together, the electron in the 3s atomic orbital of one magnesium atom shares space with the corresponding electrons on a neighboring atom to form a molecular orbital. Each Magnesium atom is touched by twelve other Magnesium atoms - and the sharing occurs between the central atom and the 3s orbitals on all of the twelve other atoms. The electrons can move freely within these molecular orbitals, and so each electron becomes detached from its parent atom. The electrons are said to be delocalized. The metal is held together by the strong forces of attraction between the positive nuclei and the delocalized electrons. In the electron sea model of metallic bonding, the metallic lattice is represented as a regular array of positive ions, i. e., metal atoms minus their valence electrons, with the valence electrons wandering relatively undisturbed through the lattice. (Frederick, 1979, P. 86)The strong attractive forces between the electrons and metal ions in the electron sea results in the metallic bond. These forces contribute to the high melting points since they require a lot of energy to break. The delocalized electrons make Magnesium a good conductor of electricity since they can move about freely in the metallic lattice. (Frederick, 1979, P. 98)Malleability is the ease with which a metal can be hammered, forged, pressed, or rolled into thin sheets. Malleability shows how mobile particles involved in metallic bonding can be pushed or pulled past each other. Because Magnesium atoms have a large number of vacancies in their outermost electron shells, the bonds do not show directional preference, and the atoms can easily rearrange relative to each other (Frederick, 1979, P.

105) Magnesium reacts readily with dilute acids to give hydrogen and the corresponding metallic salt. The outer electrons in a Magnesium atom are loosely held and hence can be easily extracted in a metal-acid reaction. (Frederick, 1979, P. 107)

REFERENCE

Frederick, M. (1979). Structure and bonding in solid state chemistry. Halsted