

Methane

Methane is a chemical compound with the chemical formula CH_4 (one atom of carbon and four atoms of hydrogen). It is a group-14 hydride and the simplest alkane, and is the main constituent of natural gas. The relative abundance of methane on Earth makes it an attractive fuel, although capturing and storing it poses challenges due to its gaseous state under normal conditions for temperature and pressure.

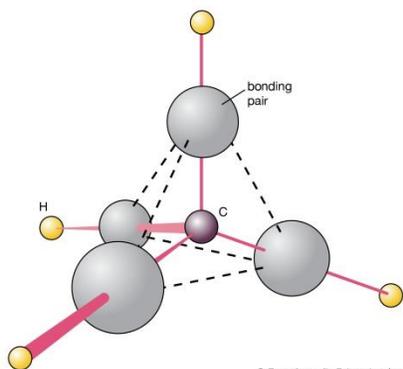
Methane, colourless odourless gas that occurs abundantly in nature and as a product of certain human activities. Methane is the simplest member of the paraffin series of hydrocarbons and is among the most potent of the greenhouse gases.

Properties:-

Methane is a tetrahedral molecule with four equivalent C–H bonds. Its electronic structure is described by four bonding molecular orbitals (MOs) resulting from the overlap of the valence orbitals on C and H. The lowest energy MO is the result of the overlap of the 2s orbital on carbon with the in-phase combination of the 1s orbitals on the four hydrogen atoms. Above this energy level is a triply degenerate set of MOs that involve overlap of the 2p orbitals on carbon with various linear combinations of the 1s orbitals on hydrogen. The resulting "three-over-one" bonding scheme is consistent with photoelectron spectroscopic measurements.

At room temperature and standard pressure, methane is a colorless, odorless gas.^[9] The familiar smell of natural gas as used in homes is achieved by the addition of an odorant, usually blends containing tert-butylthiol, as a safety measure. Methane has a boiling point of $-164\text{ }^\circ\text{C}$ ($-257.8\text{ }^\circ\text{F}$) at a pressure of one atmosphere.^[10] As a gas it is flammable over a range of concentrations (5.4–17%) in air at standard pressure.

Solid methane exists in several modifications. Presently nine are known.^[11] Cooling methane at normal pressure results in the formation of methane I. This substance crystallizes in the cubic system (space group $\text{Fm}\bar{3}\text{m}$). The positions of the hydrogen atoms are not fixed in methane I, i.e. methane molecules may rotate freely. Therefore, it is a plastic crystal.



Uses:-

Methane is used in industrial chemical processes and may be transported as a refrigerated liquid (liquefied natural gas, or LNG). While leaks from a refrigerated liquid container are initially heavier than air due to the increased density of the cold gas, the gas at ambient temperature is lighter than air. Gas pipelines distribute large amounts of natural gas, of which methane is the principal component.

Preparation:-

Preparation of methane. Methane is conveniently prepared by heating an intimate mixture of Sodium acetate anhydrate and Sodium hydroxide. This synthesis description was provided by Fritz Haber. 2.5g of Sodium hydroxide is ground to a fine powder and mixed intimately with finely powdered Sodium acetate.

