

STUDY ON ETHANE

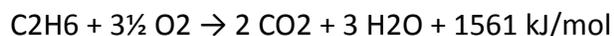
Ethane is a chemical compound with chemical formula C₂H₆. At standard temperature and pressure, ethane is a colourless, odourless gas. Its name was made from the name of ether, which at first meant diethyl ether.

How produced

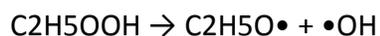
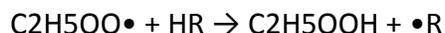
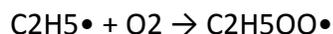
Ethane is isolated on an industrial scale from natural gas, and as a byproduct of petroleum refining. Its chief use is as petrochemical feedstock for ethylene production.

Combustion

The complete combustion of ethane releases 1561 kJ/mol, or 51.9 kJ/g, of heat, and produces carbon dioxide and water according to the chemical equation



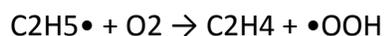
Combustion occurs by a complex series of free-radical reactions. Computer simulations of the chemical kinetics of ethane combustion have included hundreds of reactions. An important series of reaction in ethane combustion is the combination of an ethyl radical with oxygen, and the subsequent breakup of the resulting peroxide into ethoxy and hydroxyl radicals.



The principal carbon-containing products of incomplete ethane combustion are single-carbon compounds such as carbon monoxide and formaldehyde. One important route by which the carbon-carbon bond in ethane is broken to yield these single-carbon products is the decomposition of the ethoxy radical into a methyl radical and formaldehyde, which can in turn undergo further oxidation.



Some minor products in the incomplete combustion of ethane include acetaldehyde, methane, methanol, and ethanol. At higher temperatures, especially in the range 600–900 °C, ethylene is a significant product. It arises via reactions like



Similar reactions (although with species other than oxygen as the hydrogen abstractor) are involved in the production of ethylene from ethane in steam cracking.

Production

After methane, ethane is the second-largest component of natural gas. Natural gas from different gas fields varies in ethane content from less than 1% to over 6% by volume. Prior to the 1960s, ethane was typically not separated from the methane component of natural gas, but simply burnt along with the methane as a fuel. Today, however, ethane is an important petrochemical feedstock, and it is separated from the other components of natural gas in most well-developed gas fields. Ethane can also be separated from petroleum gas, a mixture of gaseous hydrocarbons that arises as a byproduct of petroleum refining.

Ethane is most efficiently separated from methane by liquefying it at cryogenic temperatures. Various refrigeration strategies exist: the most economical process presently in wide use employs turboexpansion, and can recover over 90% of the ethane in natural gas. In this process, chilled gas expands through a turbine; as it expands, its temperature drops to about -100 °C. At this low temperature, gaseous methane can be separated from the liquefied ethane and heavier hydrocarbons by distillation. Further distillation then separates ethane from the propane and heavier hydrocarbons.

Uses

The chief use of ethane is in the chemical industry, in the production of ethylene by steam cracking. When diluted with steam and briefly heated to very high temperatures (900 °C or more), heavy hydrocarbons break down into lighter hydrocarbons, and saturated hydrocarbons become unsaturated. Ethane is favored for ethylene production because the steam cracking of ethane is fairly selective for ethylene, while the steam cracking of heavier hydrocarbons yields a product mixture poorer in ethylene, and richer in heavier olefins such as propylene and butadiene, and in aromatic hydrocarbons. Experimentally, ethane is under investigation as a feedstock for other commodity chemicals.

Ethane can be used as a refrigerant in cryogenic refrigeration systems.

Health and safety

At room temperature, ethane is a flammable gas. When mixed with air at 3.0% – 12.5% by volume, it forms an explosive mixture.

Some additional precautions are necessary where ethane is stored as a cryogenic liquid. Direct contact with liquid ethane can result in severe frostbite. In addition, the vapors evaporating from liquid ethane are, until they warm to room temperature, heavier than air and can creep along the ground or gather in low places, and if they encounter an ignition source, can flash back to the body of ethane from which they evaporated.

Containers recently emptied of ethane may contain insufficient oxygen to support life. Beyond this asphyxiation hazard, ethane poses no known acute or chronic toxicological risk. It is not known or suspected to be a carcinogen.

Source : <http://engineering.wikia.com/wiki/Ethane>