Hydrogen is produced in the production of caustic soda and chlorine by *diaphragm*, *mercury* and *membrane electrochemical methods*.

The hydrogen content in the technical product is not less than 98 vol.%. The oxygen content is regulated at the level of 0.3-0.5%.

When using hydrogen obtained by mercury electrolysis of sodium chloride, the mercury content should be no more than 0.01 mg / m^3.

Depending on the method of removal of heat absorption, which reaches 72.8 kJ/mol processes are divided into *isothermal* (at a constant temperature), *adiabatic* (without heat exchange with the environment) and *combined*.

The sulfate method of HCI production is based on the interaction of sodium chloride *NaCl* with concentrated sulfuric acid H_2SO_4 at 500-550 °C. Reaction gases coming from muffle furnaces contain 50-65% hydrogen chloride, and gases from fluidized bed reactors up to 5% *HCl*. It is currently proposed to replace sulfuric acid with a mixture of SO_2 and O_2 using Fe_2O_3 as a catalyst and conducting the process at a temperature of 540°C.

The synthetic method of HCI production is based on direct synthesis of hydrochloric acid through a chain reaction of combustion:

$$H_2 + CI_2 \rightarrow 2HCI + 184.7\ kJ$$

The reaction is initiated by light, moisture, solid porous substances (charcoal, porous platinum) and some minerals (quartz, clay). Synthesis is carried out in combustion chambers with an excess of H_2 in 5-10%. The chambers are made of steel, graphite, quartz, and refractory bricks.

The most modern material that prevents contamination of the product is graphite impregnated with phenol-formaldehyde resins. To prevent explosive nature of combustion reagents are mixed directly in the flame of the burner.

In the upper zone of the combustion chambers, heat exchangers are installed to cool the reaction gases to 150-160 °C. The capacity of modern graphite furnaces reaches 65 t/day (in terms of hydrochloric acid containing 35% *HCl*). In the case of hydrogen deficiency, various modifications of the process are used. For example, a mixture of Cl_2 with water vapor is passed through a layer of porous hot coal:

$$CO + H_2O + CI_2 = 2HCI + CO_2$$

To obtain synthetic hydrochloric acid, it is possible to use waste chlorine from the condensation stage, electrolytic chlorine, and evaporated chlorine.

More than 90% of HCl is obtained from waste hydrogen chloride produced during the chlorination and dehydrochlorination of organic compounds, the pyrolysis of organochlorine wastes, metal chlorides, the production of potassium non-chlorinated fertilizers, and others. Off-gases contain various amounts of hydrogen chloride, inert impurities (N_2, H_2, CH_4), sparingly soluble organic substances (chlorobenzene, chloromethanes), water-soluble substances (acetic acid, chloral), acidic impurities and water.

In industry, adiabatic absorption schemes are most widely used to produce hydrochloric acid. Waste gases are introduced into the lower part of the absorber, and water (or dilute hydrochloric acid is introduced countercurrently to the upper one.

The dissociation of *HCl* into elements becomes noticeable at very high temperatures - more than 1,500° C. During adiabatic combustion of a stoichiometric mixture of chlorine and hydrogen at a temperature of 0°C, the theoretical flame temperature is 2,500°C. In practice, due to some dissociation of *HCl*, the flame temperature decreases to 2,200-2,400°C. An excess of one of the components of the gas mixture (usually hydrogen) somewhat lowers the combustion temperature.

At ordinary temperature, in the absence of light rays, the reaction of the formation of *HCl* from elements proceeds very slowly. When a mixture of chlorine and hydrogen is heated or under the influence of bright light, an explosion occurs due to a chain reaction: