RESERCHING PROCESS METHODS FOR THE PRODUCTION OF ACETYLENE

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Abstract. *Acetylene is a highly flammable gas which is colorless, lighter than air and has a garlic-like odor. Being colorless and inflammable gas, it is employed as a fuel and a chemical building block. It remains unstable in pure form so it is usually handled as a solution. The chemical compound with the formula C2H2 a compound of carbon and hydrogen. It is not only a hydrocarbon, but also the simplest alkyne. Lumps of calcium carbide are placed on the layer of sand in conical flask fitted with a dropping funnel and delivery tube. Water is dropped from the dropping funnel whereby ethyne(acetylene) is formed. It is passed through the acidified solution of CuSO4 for the purification.*

Key words: *hydroxide, Calcium acetylide, calcium carbide, chemical reaction, acetylene, chemical compound, molar mass.*

Introduction. Calcium carbide is not volatile and not soluble in any known solvent, and reacts with water to yield acetylene gas and calcium hydroxide. Its density is 2.22 g/cm^3. Its melt-ing point is 2160 °C, and its boil-ing point is 2300 °C. Since the acetylene that forms upon contact with water is flammable, the substance is listed. Calcium acetylide was first obtained by German chemist Friedrich Wöhler in 1862 when he heated an alloy of zinc and calcium with coal. The scientist described the reaction of calcium carbide with water. Calcium carbide reacts vigorously with even mere traces of H_2O, releasing a large amount of heat. If there is an insufficient quantity of water, the resulting acetylide spontaneously combusts. Calcium acetylide reacts violently with aqueous solutions of alkalis and diluted nonorganic acids [1]. These reactions release acetylide. With its strong reductive properties, CaC_2 reduces all metal oxides to pure metals or turns them into carbides. It is easier to obtain calcium carbide from its oxide than from calcium itself, as the oxide is reduced at temperatures above 2000 °C. The metal and carbon combine: $CaO + 3C \rightarrow CO\uparrow + CaC_2$

The reaction takes place in an electric arc furnace, where a mixture of unslaked lime and coke or anthracite is heated. The technical product is grey due to the presence of free carbon, calcium oxide, phosphide, sulfide, and other chemical compounds. CaC_2 comprises 80-85% of the product by mass.

When calcium carbide reacts with water, acetylene is released: $2H_2O + CaC_2 \rightarrow C_2H_2\uparrow + Ca(OH)_2$

Acetylene is an industrial substance with an unpleasant smell, which is caused by the impurities it contains (NH_3, H_2S, PH_3, and oth-ers). In its pure form, acetylene is a colorless gas with a characteristic faint smell, and it dissolves in water.

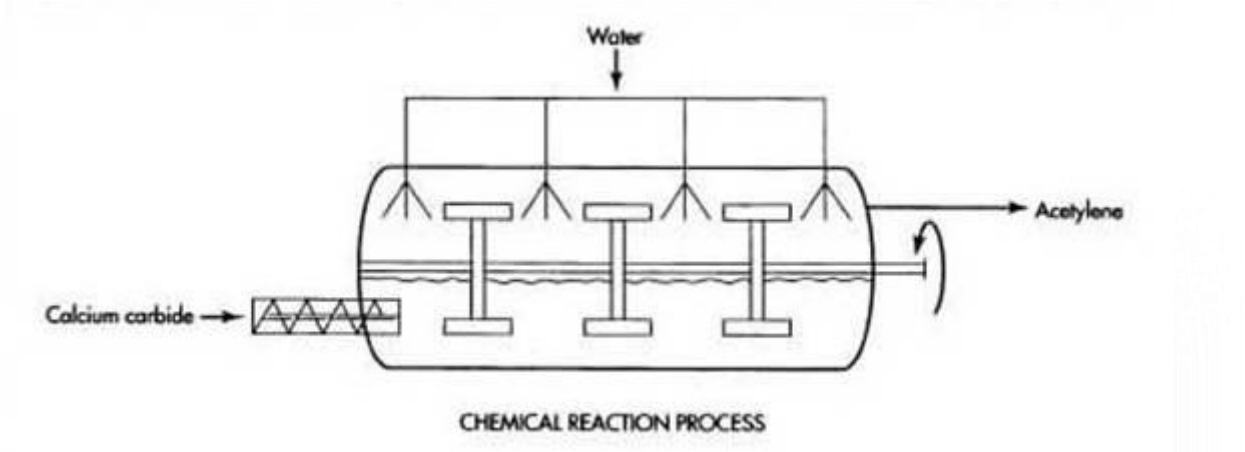

Figure 1. The chemical reaction between calcium carbide and water to generate acetylene

A simple experiment can be used to demonstrate the reaction of calcium carbide with water: pour water into a 1.5 L bottle, quickly add several pieces of calcium carbide, and close the bottle with a stopper. As a result of the ensuing reaction between calcium carbide and water, acetylene collects in the bottle as pressure builds. As soon as the reaction stops, place a burning piece of paper in the bottle – this should trigger an explosion accompanied by a fiery cloud [2]. As the walls of the bottle can burst as a result of the reaction, this experiment is dangerous, and should only be conducted with strict observance of safety precautions. o demonstrate the reaction of calcium carbide with water, the experiment can be repeated in modified form – using a six liter bottle. In this case, the components must be weighed with precision, because the greater the radius of the bottle, the less the container can withstand high pressure (assuming identical material and wall thickness). A bottle with a large capacity has a large radius, but its walls are approximately the same – accordingly, it is less resistant to pressure. To prevent it from exploding, the amount of calcium carbide must be calculated beforehand. Calcium has a molar mass of 40 g/mol, while carbon's is 12 g/mol, so the molar mass of calcium carbide is around 64 g/mol. Accordingly, 64 g of carbide will yield 22.4 L of acetylene. The volume of the bottle is 6 L, and the pressure has risen by approximately 4 atmospheres. The bottle must withstand five atmospheres: to conduct the experiment, we take around 64 g of calcium carbide and about 0.5 L of water. Place a piece of carbide inside a small bag. Push the bag into the bottle, then quickly close the bottle with the stopper. The reaction of calcium carbide with water continues for several minutes, the bottle swells up and the process is accompanied by loud bangs, but the bottle should withstand this [4]. After the release of acetylene is complete, place a hot rag soaked in hendecane on the bottle stopper,

then move away to a maximum safe distance. You will soon see a bright yellow flash, and a fountain of flame up to 4 meters high will rise out of the bottle.

Conclusion. The preparation of acetylene involves the reaction between calcium carbide and water, while testing involves assessing its flammability, purity, stability, odor, and pressure. The acetylene formula (the empirical formula of acetylene) can be represented as C_2H_2. the chemical compound can be produced using several methods the most commonly used method is the hydrolysis of calcium carbide. Another commercially important method of production is the partial combustion of methane.

REFERENCES:

1. Arutyunov, V.S., Golubeva, I.A., Eliseev, O.L., and Zhagfarov, F.G., Tekhnologiya pererabotki uglevodorodnykh gazov: Uchebnik dlya vuzov (Technology for the Processing of Hydrocarbon Gases: Textbook for Universities), Moscow: Yurait, 2021.
2. Fässler, P., Hefner, W., Buckl, K., Meinass, H., Meiswinkel, A., Wernicke, H.-J., Ebersberg, G., Müller, R.,Bäsler, J., Behringer, H., and Mayer, D., in Ullmann'sEncyclopedia of Industrial Chemistry, Weinheim: WileyVCH, 2000, vol. 1, pp. 277–326.
3. Wu Y, Zheng Q, Weng C. An experimental study on the detonation transmission behaviours in acetylene-oxygen-argon mixtures. Energy. 2018;143:554-61. https://doi.org/10.1016/j.energy.2017.11.019.
4. ONEI. Anuario estadístico de Cuba 2020. Industria manufacturera La Habana: Oficina Nacional de Estadística e Información; 2021