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Improvement of the Operation Process of Gas Burners

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Annotation: In this article, a slot burner was used to further improve the evaporation, atomization, and lower detection limits with optogalvanic spectroscopy. The flames produced by the combustion of various gases in the burners were studied propane-butane-air, acetylene (C_2H_2) - air and (C_2H_2-N_2O). The experiment measured the maximum and minimum gas consumption. Simultaneous transmission of laser light and aerosol-shaped particles from aqueous solutions of elements into the flame, the separation of these particles into atoms in the flame, and the resulting selective step excitation between the laser light and the element atoms, and the mechanisms of ion recordingwere developed. The results indicate that the collision mechanism of ionization is the dominant process.

Keywords: alternative energy, diffusion gas, gas burner, propane-butane.

A diffusion gas burner (burner) is characterized by a uniform temperature along the length of the flame. However, this gas burner (burner) requires an increase in the excess air ratio (compared to injection burners), and also creates a low thermal stress in the furnace volume and poor conditions for gas combustion in the tail part of the torch, which results in complete gas combustion. may cause it not to burn.

Diffusion gas burners (burners) are used in industrial furnaces and boilers, where a uniform temperature along the length of the flame is required. In some processes, a gas diffusion burner (burner) is indispensable. For example, in glass production, furnaces and other furnaces, when the combustion air is heated to a temperature higher than the combustion temperature of the combustible gas with air. A diffusion gas burner (burner) is also successfully used in some hot water boilers.

When a slit burner is used as an atomizer. Standard solutions prepared from the studied elements are sprayed into the gas burner in the form of an aerosol. The coefficient of use of the liquid sample of each burner is determined by quantities such as b and consumption rate v. These quantities are appropriately expressed by the following formulas:

$$\beta = V - V1V \qquad (1.1)$$

here, the volume of liquid sprayed into the burner during the V-time unit, in ml, and the volume of liquid remaining after spraying into the V1-burner, is measured in ml.

$$v = Vt \qquad (1.2)$$

here, the volume of liquid injected into the burner in the unit of V-time, in ml, and the time of spraying into the burner, t, are measured in min. The following experiments were conducted to study the efficiency of the gas burner: V = 89 ml, V1 = 70 ml when the gas pressure is 1.2 atm, the air pressure is 2.1 atm, and the time of spraying on the burner is t = 31 min. , according to the above formulas b=21-23% and consumption rate v=2.8 ml/min.

Characteristics of burners and flames Flame characteristics of burners of different designs can be compared. Each flame zone of a candle or burner has its own values due to the supply of oxygen molecules. The temperature of the open flame varies from 300 °C to 1600 °C in its different parts.

Its temperature index is from 550 to 850 ° C, which contributes to the decomposition of the thermally combustible mixture and its combustion.

In it, the flame temperature reaches 1560 ° C, which is due to the natural properties of the fuel molecules and the rate of entry of the oxidizing agent.

The change in the color of the flame depends on the substance being introduced when 1-NaCl is sprayed in the form of an aerosol; 2-when reducing the concentration of NaCl solution; 3- when CsCl is sprayed in the form of an aerosol; 4- The flame of purified gas burns at different temperature conditions. Thus, metallic magnesium burns only at 2210 ° C. The flame temperature for most solids is about 350°C. Burning matches and kerosene at 800°C, and wood can be between 850°C and 950°C.

A cigarette flame burns at a temperature of 690 to 790 °C, while a propane-butane mixture burns at a temperature of -790 °C to 1960 °C

As a result of experiments, it is possible to calculate the amount of heat released when propane-butane gas burns in a gas burner. For this we need to calculate as follows. For the 1st case, if V=800 l of propane-butane gas is burned in 1 hour, n=V/22.4=35.7 mol' of the substance is obtained. Considering the molar mass of propane-butane as C3H8+C4H10=102 kg/kmol, it follows that 35.7x102=3643=3.6 kg of gas was used. Gasoline flame burns at 1350 °C. And alcohol has a flame temperature not higher than 900 °C.

It always seems that the flame has two different colors, red and yellow. But if you look closely, you can notice that the color of the flame varies depending on what object is burning.

The amount of heat released when propane-butane gas burns in a gas burner can be calculated. For this we need to calculate as follows. For the 1st case, if V=800 l of propane-butane gas is burned in 1 hour, n=V/22.4=35.7 mol of substance is obtained. Considering the molar mass of propane-butane as C3H8+C4H10=102kg/mol, it follows that 35.7x102=3643=3.6kg of gas was used. The amount of heat released when gas burns is determined by the following formula:

$$Q = q \times m \qquad (1.3)$$

Here, q is the specific heat of combustion of the combustible gas, j/kg; The mass of m gas is measured in kg.

In that case, if q=45x106 J/kg for compressed gas, i.e. propane-butane gas, and m=3.6kg, Q=45x106 x3.6=162x106 J.

For the 2nd case, if V=400 l of propane-butane gas was burned in the 1st hour, n=V/22.4=17.86 mol of substance 1 is obtained. Considering the molar mass of propane-butane as C3H8+C4H10=102kg/mol, it follows that 17.86x102=3643=1.82 kg of gas was used. The amount of heat released during gas combustion is determined by formula 1.3:

Here, q is the specific heat of combustion of combustible gas, j/kg; The mass of m gas is measured in kg. In that case, if q=45x106 J/kg for compressed gas, i.e. propane-butane gas, and m=1.82kg, Q=45x106 x1.82=81.9x106 J. So, if the volume of the used gas decreases, the energy released when the gas burns decreases. There are several types that differ in the content of sulfur. But for the boiler it is not very important. But the division into winter and summer diesel fuel is important. The standard defines three main types of diesel fuel. The most common is summer (L), its application range is O °C and above. Winter diesel fuel (3) is used when negative temperatures air (up to -30 °C). With more low temperatures arctic (A) diesel fuel should be used. The sign of diesel fuel is its cloudy point. In fact, this is the temperature at which paraffins in diesel fuel begin to crystallize. It becomes really cloudy, and as the temperature drops further, it is jelly or frozen fat it will be like soup. The smallest crystals of paraffin clog the openings of fuel filters and safety nets, settle in pipe channels and paralyze work. The cloud point for summer fuel is -5 °C and for winter fuel -25 °C. An important indicator that must be indicated in the passport for diesel fuel is the maximum filtration temperature. Cloudy diesel fuel can be used up to the filtration temperature, and then - a clogged filter and fuel cut. Winter diesel fuel does not differ in color or smell from summer diesel fuel. In order to adequately study the process of heat exchange in industrial furnaces, first of all, when choosing the type of fuel, it is very important to study and calculate the fuel combustion process. Calculation of the combustion process of fuel is first of all to determine the amount of air required for combustion, to determine the amount of smoke gas formed during combustion, its composition and combustion temperature. When calculating the combustion of fuel, it is necessary to ensure the correct supply of air flow and the exit of smoke gas, to ensure the normal combustion process in furnaces, the movement of the flow of smoke gas, the temperature order required in the inner working part of the furnace. must be done riding. When calculating the combustion process, the amount of gas (fuel) in the furnace does not depend on burning, therefore, the amount of air required for combustion, the total volume of flue gas, the amount of burning fuel in mass or volumetric unit nm3/kg or nm3/nm3 of fuel is carried out in the given normal conditions (i.e. temperature 0 0C and pressure 101325 n/m2). The value of the burning temperature of the fuel is determined based on the heat balance, the amount of fuel and air supplied to the furnaces, and the heat of the generated flue gas. The amount of air and flue gas output is determined based on material balance in the combustion process. The type of fuel to be used in the design of industrial furnaces and drying devices is determined based on the technical and economic calculation and the fuel energy balance of the country (region). When any fuel is completely burned, it releases smoke gas in the form of SO2, N2O, and exhaust in the form of N2 and SO2 steam. If the combustion process is carried out in the presence of an excess amount of air, then the amount of O2 will also be present in the flue gas.

Summary

During the preparation of this work, the combustion efficiency of gas burners was applied using the optogalvanic method, and the results of the spectral methods were compared with the results of the selective atomic ionization method. The working principle of the selective atomic ionization spectrometer for liquid samples was studied. The system of lasers for awakening atoms and molecules, atomization system, recording system and the operation process of wavelength and laser energy control systems were studied. A propane-butane-air flame was selected for effective atomization based on the intensity of the observed selective ionization signal from atoms such as Na and Cs, and its dependence on the consumption of burning gas and laser energy was studied. It was found that the two-step excitation of the Na atom is more effective than the one-step excitation of the Cs atom. For solutions prepared from Na and Cs salts, the slit burner was carried out in propane-butane-air and acetylene-air flames. The optimal gas and air consumption for each solution (propane-butane gas-air) was determined experimentally. Controlling the consumption of burning gas in the burner using the laser spectral method is a convenient method compared to other methods.

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