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Effective Aspects Of Types And Contents Of Powder Fire Extinguishers

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ABSTRACT

In this research paper analyzes powder fire extinguishing agents, including their composition. Particular attention is paid to the means of local production. The author describes local fire extinguishing agents, for example, calcium sulfate, phosphogypsum, sodium bicarbonate and ammonium phosphate in powder form.

KEYWORDS

Dry powder fire extinguishers, calcium sulfate, phosphogypsum, sodium bicarbonate and ammonium phosphate.

INTRODUCTION

Powder fire extinguishers are finely dispersed powders of non-combustible solids, the main constituents of which are salts and oxides (e.g., carbon dioxide, etc.). Their dispersion reaches 15-20 microns. The most common powdered ingredients in our country are sodium bicarbonate and ammonium phosphate. These include sodium bicarbonate PSB-type compounds, which are used conditionally to extinguish flammable gases and liquids, as well as live equipment and electrical equipment. Phosphate is widely used in the removal of carbon solid combustible materials using ammonium salt-based PF and P-1 type compounds (Table 1).

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Table 1. Using ammonium salt-based PF and P-1 type compounds

Name of the powder	Application (fire class)	Ingredients (main component)	Consumption, kg / m²
VSE-101-K (Germany)	BCE	Potassium bicarbonate	1,5-2,0
BCE-Karate (Germany)	BCE	Potassium sulfate	2,0-2,4
Tropolar forte	ABCE	phosphorus-ammonium salts	2,0-2,5
Favorit M (Germany)	Д	Sodium chloride	20-40
Super totalit (Germany)	BCE	Sodium bicarbonate	2,5-3,0
Monnex (UK)	ABCE	An alloy of potassium carbonate and urea	0,5-1,0
P1-24 (France)	ABCE	Phosphorus-ammonium salts	
PK11-7 (France)	BC	Potassium salts	1,5-2,0
PCB (Russia)	BCE	Sodium bicarbonate	2,5-3,0
PF (Russia)	ABCE	Phosphorus-ammonium salts	2,5-3,0
P-1 (Russia)	ABCE	Phosphorus-ammonium salts	2,5-3,0
PC (Russia)	D	Sodium carbonate	20-40
CI (Russia)	Fires in pyrophoric compounds (organometallics, metals, hydrides and the like)	Silica gel (MSK, SHSK brands or KSK-50%, chladon 114V2-50%)	20-30 for pyrophoric products; 0.2-0.5 for petroleum products

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By studying the fire-fighting effectiveness of various powder fire-fighting components (hereinafter PFFC) it is possible to form a certain idea about their mechanism of action. This can be achieved by increasing the dispersion of extinguishing agents while ensuring fire-fighting efficiency for almost all PFFC (Table 2).

Table 2. Fire-fighting efficiency

Particle size, cm	The number of particles in a unit mass	Total surface area of particles, cm^2
1	1	6
0,1	1000	60
0,01	10^6	600
0,001	10^9	6000
0,0001	10^{12}	60000

In the first PFFC chemical reaction zone, the reagents act according to a simple physical mixing mechanism [1]. These particles are much smaller in mass, and their total heat capacity and heat-absorbing surface are much larger. Therefore, they heat up quickly and remove a large amount of heat from the chemical reaction area [2,3].

METHODS OF RESEARCH

Thus, the mechanisms of heterogeneous recombination at the active centers of chemical reaction on the surface of solid particles of powder fire extinguishing compounds are also of great importance. If the particles of PFF are sublimated by separation, then this endothermic process is also a natural process that causes additional heat to be removed from the chemical reaction area and mixed with vapors and gases. If the dust particles are not completely decomposed and evaporated in the chemical reaction zone, then sit down and cover the surface of the combustible material and show a shielding and insulating effect on the combustible material (resulting in air entering the pyrolysis area of the combustible material and decomposing combustion products).

It can be seen that there are different ways to stop the combustion mechanism of PFFC, the main mechanism depends on the type of burner, the mode of combustion, the applied PFFC and even the methods of its transfer to the combustion zone.
The positive aspects of PFFC can be attributed to their versatility and high fire-fighting efficiency. They also have a number of

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shortcomings. Most PFF are hydrophilic and are prone to moisture, wetting, settling, and condensation. The transfer of powdered contents to the combustion zone is complicated: they are difficult to drive out of the stored volume and out into the equipment; it is difficult to transfer large amounts of mechanical energy to them (they "do not work" in pumps, drive systems); transporting them through pipelines and transferring them to the combustion zone "in free flight" is a very complex process. The consumption of PFFC in fire-fighting and the intensity of their transmission are determined experimentally. The transmission rate of PFFC is mainly determined by calculation per unit of fire area.

The consumption of PFFC in fire-fighting and the intensity of their transmission are determined experimentally. The transmission rate of PFFC is mainly determined by calculation per unit of fire area. In Uzbekistan, there are enterprises producing phosphogypsum - phosphorus fertilizers, for example, Almalyk, Ammafos. It is currently polluting the environment by creating artificial mountains weighing several thousand tons. In our country, the processing of this product is carried out gradually, but in foreign countries, measures have already been taken to process this product. Phosphogypsum is widely used in agriculture in the preparation of mineral fertilizers and building materials. The current localization program in our country is aimed only at local producers, and does not focus on relations with foreign investors or producers.

DESCRIPTION OF LOCAL RAW MATERIALS

Description: Calcium sulphate 2 crystal hydrate water-retaining (SaSO4 * 2H2O) Phosphogyps is an additional product of the manufacturing plant, consisting of water-soluble compounds (sulfuric acid, phosphoric acid, mono and dicalcium phosphate) and insoluble (earth silicon, phosphates), phosphates two aqueous gypsum. Its main component is calcium sulfate, which contains two moles of crystalline hydrate water. It makes up 80% of phosphogypsum.

Phosphogypsum has the ability to accumulate and solidify, it can not be used as a fire-fighting powder, so different amounts of ash were added to its composition. The added ash gave the phosphogypsum the property of scattering and considerable comfort was achieved during use. A thermal analysis method was performed to study the properties of the mixture at high temperatures. Thermal Analysis The velocity of a derivatograph operating in the Paulik-Paulik-Erdey system 9 grad/min and 0.1 g.

Sensitivity of galvanometers:

T - 900, TG - 200, DTA - 1/10, DT - 1/10 gaseous media were removed using a water pump. A platinum crucible with a diameter of 7 mm was used as the holding device. Al_2O_3 was used as the reference.

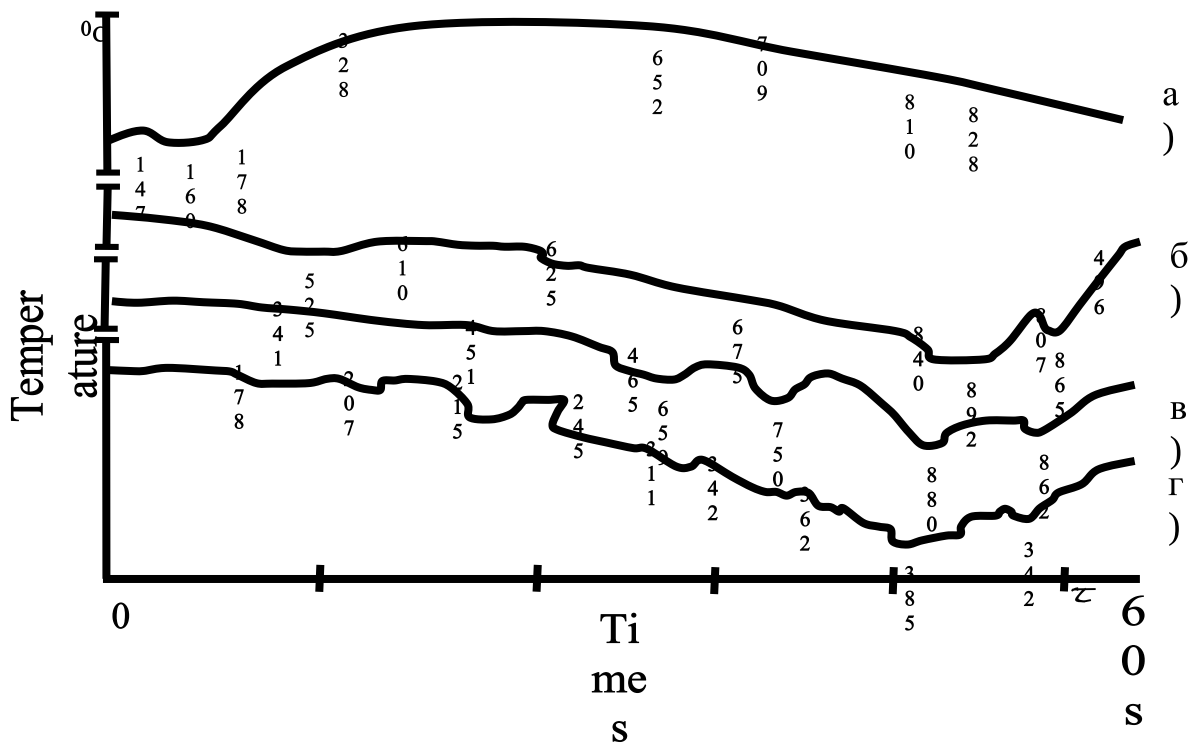

Figure 1. Differential curves of heating of powder compounds obtained on the basis of phosphogypsum. a) phosphogypsum - 100%; b) phosphogypsum - 10%;

v) phosphogypsum - 30%; g) phosphogypsum - 50%.

Six endothermic effects were detected on the curve of the phosphogypsum sample; Two exothermic effects were observed at 147, 160, 178, 328, 652, 810, 828, 709 °C, with a 4 percent mass decrease in the first three effects. The latter effect continues with a moderate decrease in mass, with 11% of the total loss of mass in the temperature range 60–900 °C along the thermogravimetry curve.

9 endothermic effects were detected on the DTA curve in a 10% sample: 156, 170, 610, 622, 628, 647, 682, 752, 892 °C, and 6 exothermic effects in the temperature range 140, 428,

496, 514, 60 - 900 °C thermogravmetry reaches 12.03% on the curve.

By heating a 30% sample, 12 endothermic effects were expressed on the curve, 110, 148, 160, 194, 273, 423, 659, 695, 736, 750, 862, 880 °C, and 18 exothermic effects 123, 220, 236, 281, 311, 341, 372, 391, 440, 451, 462, 528, 557, 566, 582, 622, 635 and 807 °C. The total mass loss in the range of 60–900 °C was 12.96% on the

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thermogravimetry curve.

In the heating curve of a sample containing more than 50%, 2 endothermic effects 154, 362 °C and 3 exothermic effects 385, 482 and 818 °C were detected. The total mass loss in the range of 60–900°C was found to be 18.85% on the thermogravimetry curve.

Studies and experiments have shown that it is invaluable in extinguishing fires by putting fire extinguishers into practice. Given the growing risk of fire in many industries, it is necessary to further improve the quality of fire extinguishers and to address the issue of expanding the range of applications, to ensure that users are thoroughly trained in the procedures and methods of their application. Fire extinguishers are mainly an effective tool in applying initial firefighting measures during the initial stages of a fire until the fire and rescue units arrive at the scene of the fire. Thus, the variation of the sample at high temperatures was determined by the method of preparation of their contents and the nature of the original compositions. Extinguishing effectiveness and properties of powder fire extinguishing compositions based on phosphogypsum were tested on the basis of test experiments in a laboratory device.

CONCLUSION

Currently, a wide range of measures is being carried out in the republic to fully localize the types and means of fire extinguishing on the basis of local dishes. In this regard, scientifically based options for rapid elimination methods that completely improve the composition of the powder are also localized, and sufficiently scientifically based results are obtained.

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