ISSN 2518-1483 (Online),
ISSN 2224-5227 (Print)

2019 • 3

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

БАЯНДАМАЛАРЫ

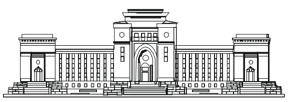
ДОКЛАДЫ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

REPORTS

OF THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN

PUBLISHED SINCE 1944



ALMATY, NAS RK

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

БАЯНДАМАЛАРЫ 2019 • 3

Б а с р е д а к т о р ы
х.ғ.д., проф., ҚР ҰҒА академигі **М.Ж. Жұрынов**

Р е д а к ц и я а л қ а с ы:

Адекенов С.М. проф., академик (Қазақстан) (бас ред. орынбасары)
Величкин В.И. проф., корр.-мүшесі (Ресей)
Вольдемар Вуйцик проф. (Польша)
Гончарук В.В. проф., академик (Украина)
Гордиенко А.И. проф., академик (Белорус)
Дука Г. проф., академик **(**Молдова)
Илолов М.И. проф., академик **(**Тәжікстан),
Леска Богуслава проф. (Польша),
Локшин В.Н. проф. чл.-корр. (Қазақстан)
Нараев В.Н. проф. (Ресей)
Неклюдов И.М. проф., академик (Украина)
Нур Изура Удзир проф. (Малайзия)
Перни Стефано проф. (Ұлыбритания)
Потапов В.А. проф. (Украина)
Прокопович Полина проф. (Ұлыбритания)
Омбаев А.М. проф., корр.-мүшесі (Қазақстан)
Өтелбаев М.О. проф., академик (Қазақстан)
Садыбеков М.А. проф., корр.-мүшесі (Қазақстан)
Сатаев М.И. проф., корр.-мүшесі (Қазақстан)
Северский И.В. проф., академик (Қазақстан)
Сикорски Марек проф., (Польша)
Рамазанов Т.С. проф., академик (Қазақстан)
Такибаев Н.Ж. проф., академик (Қазақстан), бас ред. орынбасары
Харин С.Н. проф., академик (Қазақстан)
Чечин Л.М. проф., корр.-мүшесі (Қазақстан)
Харун Парлар проф. (Германия)
Энджун Гао проф. (Қытай)
Эркебаев А.Э. проф., академик (Қырғыстан)

«Қазақстан Республикасы Ұлттық ғылым академиясының баяндамалары»
ISSN 2518-1483 (Online),
ISSN 2224-5227 (Print)

Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» Республикалық қоғамдық бірлестігі (Алматы қ.)
Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 01.06.2006 ж. берілген **№5540-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік

Мерзімділігі: жылына 6 рет.
Тиражы: 500 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18,
http://reports-science.kz/index.php/en/archive

© Қазақстан Республикасының Ұлттық ғылым академиясы, 2019

Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

Г л а в н ы й р е д а к т о р
д.х.н., проф., академик НАН РК **М. Ж. Журинов**

Р е д а к ц и о н н а я к о л л е г и я:

Адекенов С.М. проф., академик (Казахстан) (зам. гл. ред.)
Величкин В.И. проф., чл.-корр. (Россия)
Вольдемар Вуйцик проф. (Польша)
Гончарук В.В. проф., академик (Украина)
Гордиенко А.И. проф., академик (Беларусь)
Дука Г. проф., академик **(**Молдова)
Илолов М.И. проф., академик **(**Таджикистан),
Леска Богуслава проф. (Польша),
Локшин В.Н. проф. чл.-корр. (Казахстан)
Нараев В.Н. проф. (Россия)
Неклюдов И.М. проф., академик (Украина)
Нур Изура Удзир проф. (Малайзия)
Перни Стефано проф. (Великобритания)
Потапов В.А. проф. (Украина)
Прокопович Полина проф. (Великобритания)
Омбаев А.М. проф., чл.-корр. (Казахстан)
Отелбаев М.О. проф., академик (Казахстан)
Садыбеков М.А. проф., чл.-корр. (Казахстан)
Сатаев М.И. проф., чл.-корр. (Казахстан)
Северский И.В. проф., академик (Казахстан)
Сикорски Марек проф., (Польша)
Рамазанов Т.С. проф., академик (Казахстан)
Такибаев Н.Ж. проф., академик (Казахстан), зам. гл. ред.
Харин С.Н. проф., академик (Казахстан)
Чечин Л.М. проф., чл.-корр. (Казахстан)
Харун Парлар проф. (Германия)
Энджун Гао проф. (Китай)
Эркебаев А.Э. проф., академик (Кыргызстан)

Доклады Национальной академии наук Республики Казахстан»
ISSN 2518-1483 (Online),
ISSN 2224-5227 (Print)

Собственник: Республиканское общественное объединение «Национальная академия наук Республики Казахстан» (г. Алматы)
Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан **№5540-Ж**, выданное 01.06.2006 г.

Периодичность: 6 раз в год.
Тираж: 500 экземпляров

Адрес редакции: 050010, г.Алматы, ул.Шевченко, 28, ком.218-220, тел. 272-13-19, 272-13-18
http://reports-science.kz/index.php/en/archive

©Национальная академия наук Республики Казахстан, 2019 г.

Адрес типографии: ИП «Аруна», г.Алматы, ул.Муратбаева, 75

REPORTS **2019 • 3**
OF NATIONAL ACADEMY OF SCIENCES OF THE
REPUBLIC OF KAZAKHSTAN

E d i t o r i n c h i e f
doctor of chemistry, professor, academician of NAS RK **M.Zh. Zhurinov**

E d i t o r i a l b o a r d:

Adekenov S.M. prof., academician (Kazakhstan) (deputy editor in chief)
Velichkin V.I. prof., corr. member (Russia)
Voitsik Valdemar prof. (Poland)
Goncharuk V.V. prof., academician (Ukraine)
Gordiyenko A.I. prof., academician (Belarus)
Duka G. prof., academician **(**Moldova)
Ilolov M.I. prof., academician **(**Tadjikistan),
Leska Boguslava prof. (Poland),
Lokshin V.**N.** prof., corr. member. (Kazakhstan)
Narayev V.N. prof. (Russia)
Nekludov I.M. prof., academician (Ukraine)
Nur Izura Udzir prof. (Malaysia)
Perni Stephano prof. (Great Britain)
Potapov V.A. prof. (Ukraine)
Prokopovich Polina prof. (Great Britain)
Ombayev A.M. prof., corr. member. (Kazakhstan)
Otelbayv M.O. prof., academician (Kazakhstan)
Sadybekov M.A. prof., corr. member. (Kazakhstan)
Satayev M.I. prof., corr. member. (Kazakhstan)
Severskyi I.**V.** prof., academician (Kazakhstan)
Sikorski Marek prof., (Poland)
Ramazanov T.S. prof., academician (Kazakhstan)
Takibayev N.Zh. prof., academician (Kazakhstan), deputy editor in chief
Kharin S.N. prof., academician (Kazakhstan)
Chechin L.M. prof., corr. member. (Kazakhstan)
Kharun Parlar prof. (Germany)
Endzhun Gao prof. (China)
Erkebayev A.Ye. prof., academician (Kyrgyzstan)

Reports of the National Academy of Sciences of the Republic of Kazakhstan.
ISSN 2224-5227
ISSN 2518-1483 (Online),
ISSN 2224-5227 (Print)

Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)
The certificate of registration of a periodic printed publication in the Committee of Information and Archives of the Ministry of Culture and Information of the Republic of Kazakhstan N 5540-Ж, issued 01.06.2006

Periodicity: 6 times a year
Circulation: 500 copies

Editorial address: 28, Shevchenko str., of.219-220, Almaty, 050010, tel. 272-13-19, 272-13-18,
http://reports-science.kz/index.php/en/archive

© National Academy of Sciences of the Republic of Kazakhstan, 2019

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

**REPORTS OF THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN**
ISSN 2224-5227 **https://doi.org/10.32014/2019.2518-1483.70**
Volume 3, Number 325 (2019), 43 – 50

UDC 66.022.387

Sh. Shapalov[1], B. Sapargaliyeva[1], A. Naukenova[1], J. R. Ilarri[2]

[1]M. Auezov South-Kazakhstan State University, Shymkent, Kazakhstan;
[2]Polytechnic University of Valencia, Valencia, Spain

THE DEFINITION OF THE FIRE-EXTINGUISHING EFFICIENCY OF PULVERIZED INDUSTRIAL WASTE

Abstract. Currently, the production of chemical foam fire extinguishers has been canceled, and the main emphasis is on the development of effective powder flame retardant compositions. The standard formulations used are very expensive, so it is promising to study dust-like waste industry due to their low cost, low cost of finalization and the possibility of their utilization.

Explosion suppression efficiency of dust waste was determined as follows: the weight of dust fraction < 0.05 mm was weighed on an electronic balance accurate to the fourth digit, and placed in a spray bottle. Further, in the mixer, in a different ratio, a mixture of propane-butane with air is prepared. Then, through the intermediate cylinder, with the help of an electromagnetic valve, the air pulse shoved the canopy and carried the air-gas mixture into a pre-vacuumed reaction tube. Then, with the help of high-voltage inductor an electric discharge voltage of 1,000 to set to the mixture have been fire.

It was shown the examination of the fire-extinguishing ability of expired standard fire extinguishing powders.

Keywords: flame-extinguishing compounds, effectiveness of explosion, suppression, extinguishing powder, dolomite, ammophos, gas-air mixture, explosion.

Introduction. In the Republic of Kazakhstan and abroad, powders are becoming more widespread among the fire extinguishing and explosion suppressing substances. This is due to high fire extinguishing efficiency and versatility of these compositions, the ability to extinguish fires of different classes and localize explosions in a wide range of operating temperatures, as well as environmental safety of powders [1,2].

The fire-extinguishing properties of a powder are mainly due to the amount of absorbed energy in the processes of decomposition and evaporation of a substance, the intensity and range width of cooling of the flame zone.

An approximate estimation of the energy capacity of a powder is obtained by theoretical method for calculating by thermal effects of processes of decomposition and dissociation of the powder

At present, the production of chemical-foam fire extinguishers is canceled, and the main emphasis is on the development of effective powder flame suppression compounds. The standard compositions used are very expensive, so it is promising to study dusty industrial waste due to their low cost, inexpensive final modifications, and the possibility of their recycling.

Flame-suppressing powders have a number of advantages, such as:

- high fire extinguishing efficiency;
- all-weather (they are used and stored in the temperature range from -50 to + 60 ° C);
- ecological compatibility (no toxicity);
- the absence of material damage, as a rule;
- universality of action (extinguishing of electrical installations with voltage up to 1000 V and quenching even such materials that cannot be extinguished with water or other means).

At the same time, the powder compositions also have some drawbacks, the main ones being their tendency to caking and pelletizing. At the same time, powders do not possess the ability to be transported through pipelines and to form a fire-extinguishing cloud.

Even during manufacturing, the powder can absorb up to 5-10% of moisture from the wet air of the shop, if it is not protected from moisture absorption with special additives. Filled in the tank of a fire extinguisher, it is subjected to shaking and vibration during transportation or its service on transport and equipment. Being in such conditions, the powder should keep the flowability from the tank (good ejection). When solving such a problem, not only the chemical composition of the powder is significant, i.e. special additions to the basic substance, but also the technology of its manufacture, thermo and vibrostability of the powder, its anti-caking and a number of others requirements.

The explosive efficiency of the dusty wastes was determined on an experimental setup, which makes it possible to determine the volumetric concentration in kg/m^3. The experiments were carried out in the following way: a dust sample of fraction <0.05 mm was weighed on electronic scales to within a fourth sign, and placed in a nebulizer. Further, mixtures of propane-butane with air in various proportions were prepared in a mixer. Next, through an intermediate balloon, with a help of a solenoid valve, the sample was swirled and a gas-dust-air mixture was swept into the previously evacuated reaction tube. Then, with the help of a high-voltage inductor, mixtures were ignited with an electrical discharge of 1000 V. The installation scheme and the principle of its operation are described in detail in the second chapter of this dissertation.

The explosion with the spread of the flame to the top of the reaction vessel, its absence or a flare of the flame was observed visually. The results of the studies were recorded in the observation log (Table 1). Explosion is indicated as non-hatched point ○, and its absence as a hatched point ●.

The following finely dispersed substances were taken as research objects:

- slaked lime;
- a standard extinguishing powder containing ammophos;
- sediment from the chemical block of the workshop of cold rolling of steel sheet containing iron oxide;
- dolomite dust;
- baking soda (sodium bicarbonate);
- natural gypsum;
- sediment of neutralized acidic sinks.

The results of experimental studies using the adopted method are given in Table 1.

Table 1- Results of experimental studies

Name of substance	Humidity,%	t, °C	p, mmHg	Gas, %	Weight of sample	Result of experience
1	2	3	4	5	6	7
Natural gypsum	70	19,5	720	5	600	○
					700	○
					800	○
					1000	○
					1100	○
				8	1000	○
					2000	○
					3000	○
				3	600	○
					900	○
					1500	○
					3000	○
Baking soda	75	19,5	719	3	1500	○
					2000	●
				5	2000	○
					4000	◙
					4500	●
				7	3000	○
					4000	◙
					4200	●
				9	2000	●
					1500	●
					1000	○

1	2	3	4	5	6	7
Slaked lime	85	20	713	5	3000	●
					1000	○
					2200	○
					2600	○
				3	1000	●
					900	●
					500	●
					100	○
					200	○
				7	2500	●
					2000	●
					1900	○
					1800	○
				9	1800	●
					1000	●
					500	○
1	2	3	4	5	6	7
Sediment from chemical block, filtered	80	26	714	3	2000	●
					1000	○
					1500	●
					1300	●
				5	3000	○
					3500	○
					1100	●
				8	1200	○
					1700	○
					2000	○
					2500	◙
					3000	●
				9	500	◙
					1000	◙
					1100	●
1	2	3	4	5	6	7
Dolomite	85	25	715	3	1500	○
					2000	○
					3000	●
					3500	●
				6	2000	◙
					3000	○
					4000	○
					5000	○
				9	1500	○
					2000	○
					3000	●
					2500	●
				7,5	1500	○
					2000	○
					3000	○

					4000	○
				4	2000	○
					3000	○
					4000	○
					5000	●
1	2	3	4	5	6	7
Ammophos + dolomite (1:1)	80	26	727	3	400+400	●
					500+500	●
					200+200	○
					100+100	○
				6	600+600	○
					1000+1000	○
					1100+1100	●
					1250+1250	●
				7,5	1250+1250	●
					1000+1000	●
					500+500	●
					100+100	○
				9	1000+1000	●
					500+500	●
					100+100	○
1	2	3	4	5	6	7
Ammophos + lime (1:1)	75	20	720	3	500+500	●
					300+300	●
					200+200	○
					100+100	○
				5	800+800	●
					1000+1000	●
					1200+1200	○
					1300+1300	○
				7	1250+1250	○
					1000+1000	○
					500+500	●
					300+300	●
					100+100	●
				9	1250+1250	○
					1000+1000	○
					800+800	●
					500+500	●
					100+100	●

The results of more than a hundred experiments showed that the efficiency of a standard powder is much higher than that of the other samples under study. Its fire extinguishing concentration is 350 g / m³, while for dolomite - 1280 g / m³, hydrated lime - 1470 g / m³. In the remaining samples with a weight of test substances up to 2000 g / m³, it was not possible to create a fire-extinguishing concentration in the most explosive mixtures, but the dynamics of the curves yielded the following series of efficiencies:

$$Fe_2O_3 < CaSO_4 \bullet 2H_2O < Ca(OH)_2 < (Ca, Mg)CO_3 < NH_4H_2PO_4 + (NH_4)_2HPO_4$$

From the data obtained, it follows that dolomite and lime, with an explosion-suppressing capacity of 1.28 and 1.47 kg / m³, respectively, can be accepted for the development of explosion suppressing compositions. The experimental data correlate with the calculated data, where dolomite, with $\Delta H^0 298$ about 140 kJ / mol, is more effective than lime, with $\Delta H^0 298$ equal to 108 kJ / mol. However, their effectiveness is 3.7-4.2 times lower than that of ammophos.

To increase their explosion suppressing capacity, it was decided to mix them with expired typical powders.

Examination of the fire-extinguishing ability of expired standard fire extinguishing powders. Tests of substandard (overdue) powders of P-2AP, P-4AP, PSB-3, P-2GS grades of various years of issue have been conducted. The research task was to determine the safety of the operational properties of powders, and primarily their fire-extinguishing ability. Of all the overdue powders examined, the best technical and operational requirements have been preserved in fire extinguishing powders based on ammophos [3,4]. According to specifications, the following requirements are imposed on powders:

- Powders should have the appropriate characteristic (properties);
- Powders of P-2AP and P-4AP grades, according to TU 113-08-597-86, should have the composition given in Table 2.

Table 2- Composition of the fire extinguishing powders P-2AP and P-4AP

Component name	Grade of powder	
	P-2AP	P-4AP
Ammophos from apatite concentrate of grade A according to GOST 18918-85	88,2-91,5	92-94,5
Fine-grained chamotte-kaolin powder from electrofilters of rotating furnaces according to TU-14-8-358-80	7-10	4-6
Aerosil of AM-1-300 or AM-1-175 grades according to TU 6-18-185-79	1,5-1,8 2,2-2,5	1,5-2,0 -

The results of studies of overdue powders [5, 6], given in Table 3, showed that, despite their expiration, the explosion suppressing ability was preserved in all powders.

Table 3- Experimental data on the explosion suppressing ability of expired powders by the method of phlegmatization

No	Powder grade, overdue years	Basic component of fire extinguishing powder	Peak explosion-suppressing capacity, Φ=m/v, kg/m³
1	PSB-3 16 years	Sodium bicarbonate, 87-90%, with the addition of talc and metal stearates (iron, aluminum, calcium, zinc)	0.58
2	P-2AP 12 years	Ammophos, 88.2-91.5%, with the addition of chamotte-koalin powder and Aerosil of AM grade	0.43
3	P-2AP 14 years	Ammophos, 88.2-91.5%, with the addition of chamotte-koalin powder and Aerosil of AM grade	0.45
4	P-2GS 11 years	Chlorides of alkali metals	0.52

The volumetric fire-extinguishing capacity for P-2AP powder is Φ = 0.1 kg / m³; for PSB-3, Φ = 0.7-0.8 kg / m³; and for the powder based on ammonia of Pirant, Φ = 0.8 kg / m³.

The properties of 4 kinds of powders with different periods of expiration are investigated (see Table 4). Their fluidity and flowability appeared to be worse than normative; there were lumps of various solidity.

The investigated explosion-suppressing ability of the pre-crushed overdue powders was max 0.43-0.58 kg / m³, against 0.35 kg / m³ of the valid ammophos, and is in the interval specified by regulatory documents. So, according to the specifications, the explosion suppressing (volumetric) capacity of standard powders is in the range of 0.1-0.8 kg / m³.

Thus, it can be seen from experiments that the overdue powders have not lost their fire-extinguishing ability, and can be used as extinguishing agents. When used, it is possible to mix the conditioned and expired powders in various proportions. The expired fire extinguishing powder needs to be grinded before use, which occurs when the components of the extinguishing agent are mixed [17-20].

Table 4- Experimental quality indicators of expired fire extinguishing powders

Powder grade, overdue years	Appearance	Fluidity, kg/sec	Flowability when poured by hand	Destruction of lumps when falling from a height of 20 cm	TU 113-08-597-86 Grading of particles, %		
					Particles larger than 0.2 mm, not more than 2	Particles larger than 0.1 mm	Particles smaller than 0,05 mm, not less than 70
P-2AP 14 years	White fine powder with lumps up to 100 mm	0.34	Does not stick together, flows	Lumps are destroyed in dust	1.8-2.0	Not controlled	60-68
P-2AP 12 years	White fine powder with lumps up to 100 mm	0.30	Does not stick together, flows	Lumpse are destroyed in dust	1.8-2.0	Not controlled	68-70
PSB-3 16 years	Gray disperse powder with lumps up to 100-150 mm	0.40	Does not flow	The lumps do not destroy, they crumble into smaller ones	2.5-2.8	10-20	60-65
P-2GS 11 years	Beige fine powder without lumps, thick	0.36	Does not flow	-	2.2-2.5	5-10	60-68

A significant part of industrial waste in South Kazakhstan has been produced by the former Shymkent phosphorus plant, where, until 1995, above 3 million tons had accumulated; by the former Shymkent lead plant (more than 4 million tons of sludge); from the coal mining industry at the Lenger field (about 6 million tons of waste).

The emerging problems of dumping and storage of wastes from various industries in the Republic of Kazakhstan require the adoption of a government program for their disposal and the creation of a regulatory framework, the strengthening of measures to protect the environment and the subsoil of the earth. In manufacturing plants that produce and dump industrial waste, incentives should be generated for waste management and recycling. Therefore, to improve the ecological situation in the region, it is necessary to neutralize, recycle or dispose of industrial waste without harming the environment.

Compositions based on gypsum, as well as products made from them, are widely used as flame retardant materials. The heat-shielding, sound-insulating properties and fire resistance of gypsum materials surpass cement-based materials, and they are unparalleled in construction in terms of decorative, comfortable, and environmental performance.

At the same time, the depletion of the reserves of natural gypsum stone and their uneven distribution in the territory of Kazakhstan forced us to look at industrial waste in the form of phosphogypsum and fluorogips. The largest tonnage waste currently is phosphogypsum - a by-product obtained in the production of orthophosphoric acid and mineral fertilizers. Phosphogypsum is obtained in the form of sludge waste with humidity up to 50%.

However, the presence in phosphogypsum of pollutants in the form of phosphorus and fluorine compounds, during the preparation of which sludge wastes are emitted into the air, adversely affecting not only the human body, but also the environment [20-22].

In this regard, in order to prepare phosphogypsum for the production of flame retardant gypsum compounds, it is proposed to carry out the mechanochemical activation of phosphogypsum together with dolomitic lime using the universal disintegrator-activator technology (UDA-technology).

Conclusions. 1.It is experimentally established, that the fire-extinguishing capacity of powders increases in the following sequence:

$$Fe_2O_3 < CaSO_4 \cdot 2H_2O < Ca(OH)_2 < (Ca, Mg)CO_3 < NH_4H_2PO_4 + (NH_4)_2HPO_4$$

2. Theoretically determined values of endothermic effects for decomposition reactions of the base components of extinguishing powders are correlated with the relative fire-extinguishing ability in the established series.

3. The consistency of the relative fire-extinguishing efficiency of powders with the values of endoeffects calculated according to thermograms is shown.

4. An insignificant decrease in the fire-extinguishing capacity of overdue powders has been established. Their re-grinding after additional grinding and sieving is proposed, as well as the development of complex compositions with dispersed wastes.

5. The next stage of the work is supposed to explore the physical mechanical properties of gypsum stone based on the prepared phosphogypsum and dolomitic limestone, as well as its flame retardant properties.

Ш. Шапалов[1], Б. Сапаргалиева[1], А. Наукенова[1], Х. Р. Иларри[2]

[1]М. Ауезов атындағы Оңтүстік Қазақстан мемлекеттік университеті, Шымкент, Казахстан,
[2]Валенсия Политехникалық университет, Валенсия, Испания

ШАҢДЫ ОНЕРКӘСІПТІК ҚАЛДЫҚТАРДЫҢ ӨРТ СӨНДІРУ ТИІМДІЛІГІН АНЫҚТАУ

Аннотация. Қазіргі уақытта химиялық көбікті өрт сөндіргіштерін шығару тоқтатылып, негізінен ұнтақты өрт сөндіргіш қоспаларды әзірлеуге баса назар аударылуда. Қолданылатын стандартты құрамдар өте қымбат, сондықтан аса қымбат емес, және де олардың түпкілікті жетілдіру шығындары төмен болуына байланысты шаң тәріздес өнеркәсіптік қалдықтарды зерттеу және оларды пайдалану мүмкіндіктерін зерттеу перспективті болып табылады.

Шаң тәріздес қалдықтардың жарылғыштықты басу тиімділігі төмендегідей анықталды: шаңды фракциясының <0,05 мм үлгісі төрт таңбаның дәлдігімен электрондық таразыда өлшеніп, бүріккіш аппаратқа орналастырылды. Содан кейін түрлі аралық салмақта пропан-бутанның ауамен қоспасы әзірленді. Сонымен бірге электромагнитті клапан арқылы аралық баллонға әуе импульсы арқылы қоспаны құйындатып, одан газды-шаңды-ауа қоспасы алдын ала вакуумдалған реакциялық трубкаға тасымалданып, жоғары вольтты индуктордың көмегімен 1000 В электр разряд кернеуінде қоспа қыздырылды.

Түйін сөздер: от сөндіргіш қоспалар, жарылғышты басу тиімділігі, өрт сөндіру ұнтағы, доломит, аммофос, газ қоспасы, жарылғыштық.

Ш. Шапалов[1], Б. Сапаргалиева[1], А. Наукенова[1], Х. Р. Иларри[2]

[1]Южно-казахстанский государственный университет им. М.Ауэзова, Шымкент, Казахстан;
[2]Политехнический университет Валенсии, Валенсия, Испания

ОПРЕДЕЛЕНИЕ ОГНЕТУШАЩЕЙ ЭФФЕКТИВНОСТИ ПЫЛЕВИДНЫХ ПРОМЫШЛЕННЫХ ОТХОДОВ

Аннотация. В настоящее время выпуск химически-пенных огнетушителей отменен, и основной упор делается на разработку эффективных порошковых пламеподавляющих составов. Применяемые стандартные составы очень дороги, поэтому перспективно изучение пылевидных отходов промышленности в связи с их дешевизной, малыми затратами на окончательную доработку и возможностью их утилизации.

Взрывоподавляющую эффективность пылевидных отходов определяли следующим образом: навеску пыли фракции < 0,05 мм взвешивали на электронных весах с точностью до четвертого знака, и помещали в распылитель. Далее в смесителе, в различном соотношении, готовили смеси пропан - бутана с воздухом. Затем через промежуточный баллон, с помощью электромагнитного клапана, импульсом воздуха взвихряли навеску и увлекали газопылевоздушную смесь в предварительно вакуумированную реакционную трубку. Потом, с помощью высоковольтного индуктора, электрическим разрядом напряжением в 1000 В поджигали смеси.

Ключевые слова: пламягасящие составы, взрывоподавляющая эффективность, огнетушащий порошок, доломит, аммофос, газовоздушная смесь, взрываемость.

Information about authors:

Bayan Sapargalieva – PhD student in 6D073100 “Life safety and environmental protection”, M.Auezov South-Kazakhstan State University, Shymkent, Kazakhstan;

Aigul Naukenova – Candidate of Technical Sciences, Associated Professor of the Department “Life safety and Environmental protection”, M.Auezov South-Kazakhstan State University, Shymkent, Kazakhstan;

Javier Rodrigo Ilarri - PhD, Professor of Department of Hydraulic Engineering and Environment, Polytechnic University of Valencia, Valencia, Spain;

Shermakhan Shapalov – PhD of the Department “Life safety and Environmental protection”, M.Auezov South-Kazakhstan State University, Shymkent, Kazakhstan

REFERENCES

[1] Chernysheva A.A., Bekzhanova M.M., Babarykina O.S. Fire-extinguishing powder compositions // Technology of production of metals and secondary materials, Temirtau, 2007, No 1, pp. 166-169.

[2] Chernysheva A.A. Fire-extinguishing compositions on the basis of substandard P-2AP powder and screening of dolomitic dust //Proceedings of KarSTU, Karaganda, 2008, No 1, pp.52-54.

[3] Chernysheva A.A., Toleshev A.K., Lehtmets V.L. Method of extending the life of extinguishing powders // Metallurg, 2008, No. 4, pp.37-38.

[4] Chernysheva A.A. Durability and efficiency of use of fire extinguishing substances at mining enterprises // Pract. Conf. "Improving the quality of education and research", Ekibastuz, 2008, pp. 299-302.

[5] Copyright certificate 4803081/26, SU 1832039 A1. Active base for fire extinguishing powders of multi-purpose use. 1993, No. 29.

[6] Copyright certificate 4853670/26, SU 1797923 A1. Fire extinguishing powder composition and the method of its production. 1993, No. 8.

[7] Chernysheva A.A. The second life of expired fire-extinguishing powders used in mining enterprises. Proceedings of international scientific conf. Pract. young scientists, students and schoolchildren "VIII Satpaev Readings", Pavlodar, 2008, pp. 90-94.

[8] Plotnikov V.M., Belyaev V.V. Destructive and damaging effect of emergency explosions. Almaty, 2001. 98 p.

[9] Govorov V.I., Chernysheva A.A., Chernyshova T.P., Prokhorchenko N.V. New perspectives of metallurgical waste utilization // Pract. Conf. "Innovation in the environment", Kokshetau, 2004, pp. 157-160.

[10] Govorov V.I., Chernysheva A.A. On the directions in the prevention of explosions of powder materials // The technology of metal production, Almaty, 2000, pp. 171-172.

[11] Manual on the use and application of automatic systems of explosion suppression - localization of explosions in underground mine workings of coal mines that are dangerous for gas and dust. Department of Coal Industry of the Ministry of Energy of the Russian Federation. Moscow, 2003. 25 p.

[12] Govorov V.I., Chernysheva A.A., Tribunsky O.S., Krivenko T.S. A technique for evaluating the fire-extinguishing efficiency of powdered waste. // Technology of production of metals and secondary materials, Temirtau, 2004, pp. 166-169.

[13] Kim A.V., Chernysheva A.A. Criteria of fire and explosion hazard of industrial dust. National Center of Scientific and Technical Information, Karaganda, 2007. 21 p.

[14] Kushchuk V.A., Markin A.M., Dolgovidov A.V. Problems of methodical determination of the fire-extinguishing ability of powder means for automatic installations // Large fires: prevention and suppression. Proceedings of the scientific conference. Moscow, 2001, pp. 180-183.

[15] Chernysheva A.A. On the possibility of using dolomite dust in fire extinguishing compositions // Pract. Conf. "Scientific and technological progress in metallurgy», Temirtau, 2007, pp. 365-368.

[16] Dyusebaev M.K., Govorov V.I., Chernysheva A.A. On the application of fine-dispersed wastes in fire-extinguishing compositions // "Science news of Kazakhstan", Almaty, 2007, No. 4, pp. 49-54.

[17] Chernysheva A.A., Bekzhanova M.M., Babarykina O.S. Fire-extinguishing powder compositions // Technology of production of metals and secondary materials, Temirtau, 2007, No. 1, pp. 166-169.

[18] Chernysheva A.A. Fire-extinguishing compositions on the basis of substandard P-2AP powder and screening of dolomitic dust //Proceedings of KarSTU, Karaganda, 2008, No. 1, pp.52-54.

[19] Sapargaliyeva B., Naukenova A., Javier Rodrigo Ilarri, Aubakirova T., Ermukhanova N. The problem state of explosions of powder compositions prevention and suppression// IScience, Actual scientific research in the modern world, Collection of scientific works. - Issue 11 (31), 2017. Part 10. P. 52-57.

[20] Sapargalieva B., Naukenova A., Egeubayeva A., Aubakirova T., Shapalov Sh., Javier Rodrigo Ilarri. The investigation of fire extinguishing ability of the powder materials by extended extinguishing and suppression of explosions of gas-air mixtures// Wydawnictwo Naukowe "iScience", Modern Scientific Challenges and Trends: a collection scientific works of the International scientific conference. Warsaw, 2018. P. 22-31.

[21] Hint Y.A. UDA-technology: problems and prospects. Tallinn: Valgus, 1981. 36 p., Il.

[22] I. V. Bondarenko, O. I. Kutnyashenko, Y. I. Rudyk, S. V. Solyonyj//News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technical sciences. 2019 Vol. 2, N 434. P.120-130. ISSN 2224-5278. https://doi.org/10.32014/2019.2518-170X.45

Publication Ethics and Publication Malpractice in the journals of the National Academy of Sciences of the Republic of Kazakhstan

For information on Ethics in publishing and Ethical guidelines for journal publication see http://www.elsevier.com/publishingethics and http://www.elsevier.com/journal-authors/ethics.

Submission of an article to the National Academy of Sciences of the Republic of Kazakhstan implies that the work described has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see http://www.elsevier.com/postingpolicy), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. In particular, translations into English of papers already published in another language are not accepted.

No other forms of scientific misconduct are allowed, such as plagiarism, falsification, fraudulent data, incorrect interpretation of other works, incorrect citations, etc. The National Academy of Sciences of the Republic of Kazakhstan follows the Code of Conduct of the Committee on Publication Ethics (COPE), and follows the COPE Flowcharts for Resolving Cases of Suspected Misconduct (http://publicationethics.org/files/u2/New_Code.pdf). To verify originality, your article may be checked by the originality detection service Cross Check http://www.elsevier.com/editors/plagdetect.

The authors are obliged to participate in peer review process and be ready to provide corrections, clarifications, retractions and apologies when needed. All authors of a paper should have significantly contributed to the research.

The reviewers should provide objective judgments and should point out relevant published works which are not yet cited. Reviewed articles should be treated confidentially. The reviewers will be chosen in such a way that there is no conflict of interests with respect to the research, the authors and/or the research funders.

The editors have complete responsibility and authority to reject or accept a paper, and they will only accept a paper when reasonably certain. They will preserve anonymity of reviewers and promote publication of corrections, clarifications, retractions and apologies when needed. The acceptance of a paper automatically implies the copyright transfer to the National Academy of sciences of the Republic of Kazakhstan.

The Editorial Board of the National Academy of sciences of the Republic of Kazakhstan will monitor and safeguard publishing ethics.

Правила оформления статьи для публикации в журнале смотреть на сайте:

www:nauka-nanrk.kz

ISSN 2518-1483 (Online), ISSN 2224-5227 (Print)

http://reports-science.kz/index.php/en/archive

Редакторы *М. С. Ахметова, Т.А. Апендиев, Д.С. Аленов*
Верстка на компьютере *А.М. Кульгинбаевой*

Подписано в печать 6.06.2019.
Формат 60х881/8. Бумага офсетная. Печать – ризограф.
15,5 п.л. Тираж 500. Заказ 3.

Национальная академия наук РК
050010, Алматы, ул. Шевченко, 28, т. 272-13-18, 272-13-19