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# SLAG-ALKALINE BINDERS COMPOSITION INVESTIGATION BY INFLUENCE ON ENVIRONMENT

**Naukenova A.S.[1], Aubakirova T.S.[2]*, Mizamov N.R.[3],Kurmanbayeva M.S.[4], ShapalovSh.K.[5], Rakhmanberdieva J.N. [6], Tursynbekova E.N.[7], Oralbekova L.M.[8], Sirmanova.Z.K.[9], Serikbaev S.M.[10].**

*Taslima.aubakirova@mail.ru
M. Auezov South Kazakhstan State University[1,2,3,5,6,7,8,9,10] ,Soutsh Kazakhstan state pharmaceutical academy[9],Shymkent,
Kazakh National University Al Farabi[4], Almaty, Kazakhstan

**Key words:** Electric-thermo-phosphoric slag, slag-alkaline binder and concretes, component, phase, activizators, clinker-formation, system

**Abstract.** The article considers information about the influence of the method of entering of supplements and additives dehydrated clay on the properties of slag stone binders and concretes.

The article is aimed to development of technological basis of production unburned alkaline binders and concretes on their base of electro-thermal phosphoric slag with additions of dehydrated clays with high operational properties.

There have been investigated in connection with this the increased physical-mechanical properties of slag-alkaline binders and concretes on their base with the addition of 25% dehydrated clay.

The influence of the fineness of grind, type of slag and alkaline component, conditions of hardening on the properties of slag binders and concretes on their base,as well as average density, water absorption and strength characteristics were investigated.

Blast-furnace slag with the following chemical composition, mass.,%: $SiO_2$ – 58; $Al_2O_3$ + $TiO_2$ - 28; $Fe_2O_3$ +FeO – 4; CaO – 5; MgO – 0,98; $SO_3$– 0,7; $Na_2O$ – 0,60.

Due to application of numerous industrial wastes in the new compositional structure we pursue aim the diminishing of natural material expenses as well as conservation of our environment as possible as cleaner.

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# ИССЛЕДОВАНИЕ СОСТАВА ШЛАКО-ЩЕЛОЧНЫХ ВЯЖУЩИХ ПУТЕМ ВЛИЯНИЯ НА ОКРУЖАЮЩУЮ СРЕДУ

**Наукенова А.С.[1], Аубакирова Т.С.[2]*, Мизамов Н.Р.[3], Курманбаева М.С.[4], Шапалов Ш.К.[5], Рахманбердиева Ж.[6],Турсынбекова Э.Н.[7], Оралбекова Л.М.[8], Сырманова З.К.[9], Серикбаев С.М.[10].**

*Taslima.aubakirova@mail.ru

Южно-Казахстанский государственный университет им. М.Ауезова[1,2,3,5,6,7,8,10] ,Южно- Казахстанская государственная фармацевтическая академия [9], Шымкент, Казахский национальный университет им. аль-Фараби[4], Алматы, Казахстан

**Ключевые слова:** Электротермофосфорный шлак, шлакощелочные вяжущие и бетоны, компонент, фаза, активизаторы, клинкерообразование, система.

**Аннотация.** Данная статья рассматривает информацию о влиянии метода введения включений и добавок дегидратированной глины на свойства камня шлакощелочного вяжущего и бетонов.

Работа нацелена на разработку технологической основы производства безобжигового вяжущих и бетонов на основе электротермофосфорного шлака с добавками дегидратированной глины с высокими эксплуатационными характеристиками.

В связи с этим были исследованы расширенные физико-механические свойства шлакощелочных вяжущих и бетонов на их основе с добавкой 25 % дегидратированной глины.

Были исследованывлияние тонкости помола, вида шлака и щелочного компонента, условий твердения свойства шлако-щелочных вяжущих и бетонов на их основе, тем самым изменяют среднюю плотность, водопоглащение и прочностные характеристики.

Сталеплавильный шлак со следующим химическим составом, масс.,%: $SiO_2$ – 58; $Al_2O_3$ + $TiO_2$ - 28; $Fe_2O_3$ +FeO – 4; CaO – 5; MgO – 0,98; $SO_3$– 0,7; $Na_2O$ – 0,60.

Благодаря применению некоторого ряда промышленных отходов в новом композиционном материале мы приследовали цель уменьшения расходов природного материала и сохранение нашей окружающей среды как можно чище.

**Introduction.** Nowadays it is expanded the area of slag-alkaline binders and concretes application on the base of electro-thermo-phosphoric slag and complex modifiers of natural hardening. There are developed the compositions of slag-alkaline binders and concretes on the base of electro-thermo-phosphoric slag and complex modifiers of natural hardening for road construction.

When studying powdery mineral binder is important to consider the dependence of the speed of hydration as well chemical activity of the substances of particle size distribution. Thus, samples of the cement particles of 0-5 mm after 24 h the strength is 75-80% of maximum. However, the absolute strength of the cement paste prepared from a fine fraction is the highest. Cement paste obtained from fractions 5-10, respectively, 10-20, 20-60 microns hardens more slowly than the fraction of 0-5 microns, but it reaches a later time great strength. In this case, the coarser fraction, the slower the hardening cement paste and the later reaches high strength. [1-6]. Approximate the role of individual fractions of cement on the strength of cement paste is as follows: 0-5 micron fraction contributes to the strength in the first 0-24 hours of hardening; fraction 7-30 microns - the main fraction, which determines the quality of cement in general; fraction - 30-60 microns helps increased strength after 28 days of hardening; fraction 60-200 microns, and more hydrated slowly in a long time, compacting cement stone [7-13].

**Methods of research.** Determination of slag-sand consistency solution produced by the method of spreading of the standard cone on shaking table in accordance with GST 310.4-81 * "Methods for the determination of the compressive strength and flexural strength. Samples were stored after production forms a top surface covering for 3 days in air-dry conditions and then stored in normal-humidity conditions prior to testing. Accelerated test binder produced by the following method the samples were prepared in accordance with the requirements of GST 310.4-81 * "Methods for determining the compressive strength and flexural strength" in view of the above changes, no earlier than 4 hours and not later than 12 hours after making steamed in forms on the regime $3\times6\times3$ h isothermal heating at a temperature 95 ± 5°[14-20]. Testing of the samples was carried out by one day from the date of manufacture. Grinding-ability of slag-alkaline binders on electric-thermal phosphoric slag is brought in the figure 1.

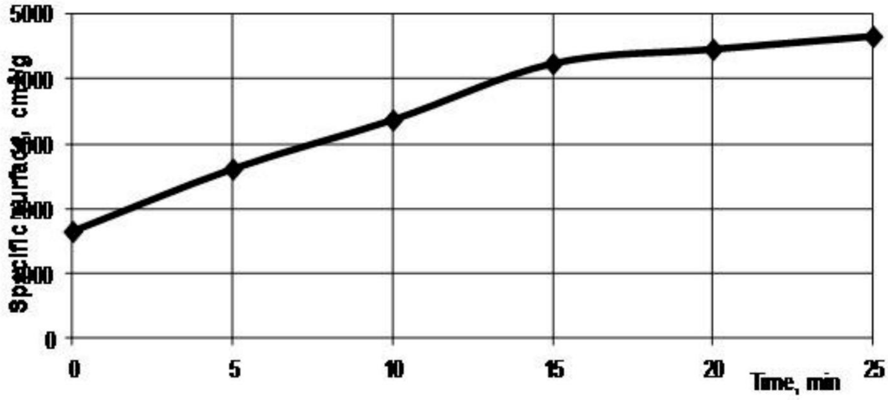
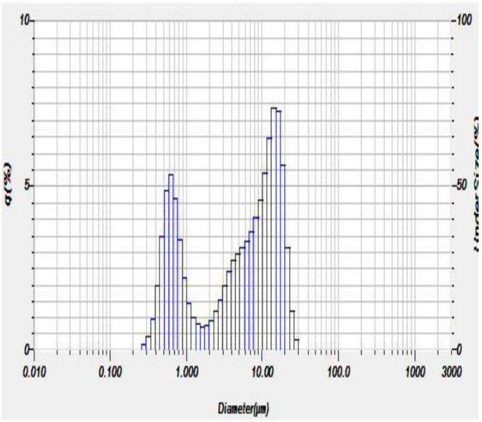


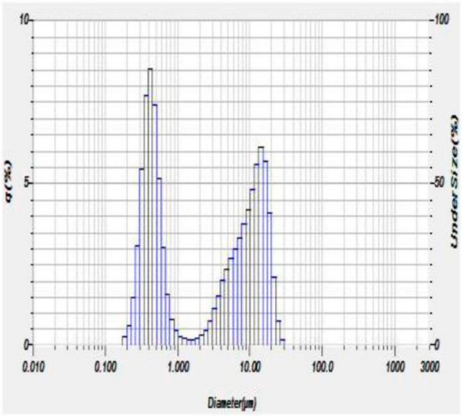

Fig.1 Grinding-ability of slag-alkaline binders on electric-thermal phosphoric slag

The experimental data of particles distribution according to size of electric-thermo phosphoric slag are brought in the figure 2.

**environment-water**

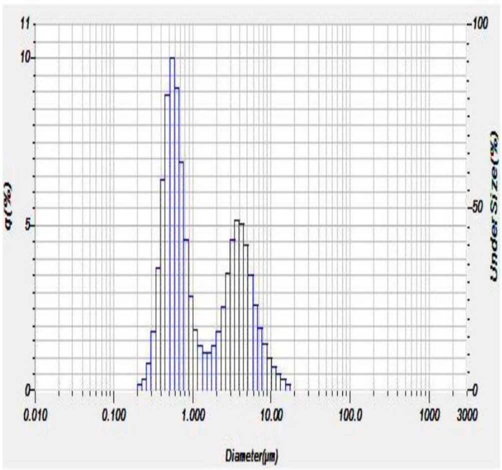



**Electric-thermal phosphoric slag without ultra-sonic treatment**

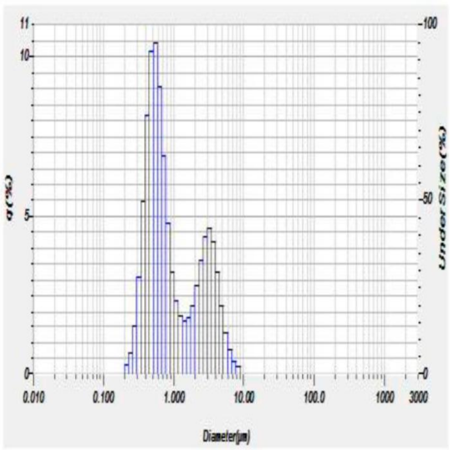



**Electric-thermal phosphoric slag with ultra-sonic treatment 1 minute**

**environment-ethanol**




**Electric-thermal phosphoric slag without ultra-sonic treatment**




**Electric-thermal phosphoric slag with ultra-sonic treatment 1 minute**

Fig. 2-Particles distribution according to size of electric-thermo phosphoric slag

**Results of researches.** It is known that slag glass has a microheterogeneous structure and consists of three interrelated structural elements: crystals, amorphous and the surrounding amorphous intermediate.

Found that their activity decreases in the following order: amorfity crystals. Thus, the latter exerts its activity only in the presence of alkali activating components. Obviously, the alkaline components primarily interact with the crystallites and then - in series with and intermediate amorphous substance. Such hydrations of the slag-alkaline binder mechanism possible, alkaline components are simultaneously in contact with all the structural elements of the slag.

**Results discussion.** It was established optimal number of complex modifiers, surface area and density of the solutions that provide a given concrete structure with techniques of mathematical planning of the experiment; It was maintained the dependence of the process formation of structure the hardening of slag-alkaline binder of natural hardening from degree of completion of the hydration process of slag-alkaline cement stone;

It was studied the kinetics of shear strength and durability of slag-alkaline based on electro-thermo-phosphoric slag and complex modifiers of natural hardening;

**Conclustion.** It is established that optimal quantity of aluminum-silicate additive of dehydrated clay are in the limits of 15-35%, chemical additive – Relamix in 2,5-3,5 % and thinness of grinding – 500-600 $m^2$/kg, as well solution density 1115-1125 g/ $m^3$.

The formation of hydrated cementing phases through solution occurs in the result of amorphites and crystallites dissolution. And hydrated phases are realized by means of alkaline components entering into structure of intermediate substances according to topochemical mechanism.

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# ҚОРШАҒАН ОРТАҒА ӘСЕРДІ БАҒАЛАУ АРҚЫЛЫ ШЛАК-СІЛТІЛІ ТҰТҚЫРЛАРДЫҢ ҚҰРАМЫН ЗЕРТТЕУ

**Наукенова А.С.[1], Аубакирова Т.С.[2] *, Мизамов Н.Р.[3], Курманбаева М.С.[4], Шапалов Ш.К.[5], Рахманбердиева Ж.[6],Турсынбекова Э.Н.[7], Оралбекова Л.М.[8], Сырманова З.К.[9], Серикбаев С.М.[10].**

*Taslima.aubakirova@mail.ru

М.Ауезов атындағы Оңтүстік Қазақстан Мемлекеттік Университеті [1,2,3,5,6,7,8,10], Оңтүстік Қазақстан мемлекеттік фармацевтика академиясы [9], Шымкент, Әл-Фараби атындағы Қазақ ұлттық университеті [4], Алматы, Казахстан

**Түйін сөздер:** Электротермофосфорлы қалдық, шлак-сілтілі тұтқырлар мен бетоны, компонент, фаза, активизаторлар, клинкер құру, жүйе.

**Аңдатпа.** Шлак-сілтілі тұтқырлар мен бетондардың тастарының қасиеттеріне дегидратталған қыштың қосындыларының ендіруіндегі әсері туралы мәліметтерді қарастыратын мақала.

Жоғары эксплуатациялық қасиеттерімен дегидратталған қыштың қосындыларымен электротермофосфорлы қалдықтардың негізінде технологияны өндіруді ойлап табу бойынша бұл жұмыс бағытталған.

Дегидратталған қыштың 25 % қосындыларымен шлак-сілтілі тұтқырлар мен бетондардың кеңейтілген физикалық-механикалық қасиеттері бұл тұрғыда зерттеулер жүргізілді.

Келесі аталған зерттеулер жүргізілді пайдалану ұнтақтарының әсері, тұтқыр мен сілтілі компоненттің түрі, шлак-сілтілі тұтқырлар мен бетондардың, оның негізіндегі қату жағдайлардың ерекшеліктері, соған қоса орташа тығыздығы, су сіңіргіштігі және беріктілік қасиеттері.

Болат бақытылмасының қалдықтары келесі химиялық құрамын құрайды,

масс.,%: $SiO_2$ – 58; $Al_2O_3$ + $TiO_2$ - 28; $Fe_2O_3$ +FeO – 4; CaO – 5; MgO – 0,98; $SO_3$– 0,7; $Na_2O$ – 0,60.

Кейбір өндірістік қалдықтарды жаңа композициялық материал қолдануға байланысты біз екі мақсатты көздедік, ең біріншісі, табиғи материалдарды үнемдеу, екіншісі, қоршаған ортаны таза сақтау.