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ADDITIVES FOR IMPROVING THE PHYSICAL AND MECHANICAL PROPERTIES OF CLAYDITE CONCRETE

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Abstract
This article discusses a way to improve some properties of ceramsite concrete, research when adding a gypsum-cement-pozzolanic binder based on magnesia cement and phosphorus-slag binder to it, an analysis of the physical and technical characteristics for promising use in construction..

Keywords: ceramsite concrete, additive, physical and mechanical properties, building materials, cement, water absorption, frost resistance.

In recent years, special attention has been paid to such a direction of the construction industry as low-rise construction. This rapidly developing area requires the development and implementation of new building technologies, as well as building materials that could meet high requirements for durability, energy efficiency and environmental friendliness and at the same time have a low cost. One of the most promising building materials that could meet all of the above requirements is gypsum. This is due to the fact that products based on it meet all modern requirements for fire resistance, sound absorption, environmental safety and energy saving at all stages of the life cycle, from the extraction of raw materials to disposal, as well as the availability of a good raw material base.

Among the existing technologies for the construction of low-rise buildings, one can single out buildings made of wood, brick, block, monolithic and panel made of lightweight, cellular and other concrete, as well as ceramics. It is difficult to determine the priority in terms of technical and economic efficiency of using Portland cement concrete or brick for the construction of residential buildings, since each of them has its own advantages and disadvantages. From the point of view of the energy intensity of 1 m of the outer wall of a residential building, these materials are practically equivalent (30...40 kg.e.t./m^2 for a brick wall and 32...37 kg.e.t./m^2 for a claydite-concrete wall). Residential buildings made of lightweight concrete, both monolithic and large wall stones, are more industrial and require less labor compared to brick ones, but the latter have undeniable advantages in terms of aesthetic and sanitary requirements for housing.

Along with slag-gypsum block houses, fully prefabricated two-story houses were built, the basis of which was a frame with columns made of gypsum concrete blocks. Gypsum slabs were mounted between the columns in two rows, and the sinuses were covered with slag. To increase the rigidity of the holes in the blocks, as the columns were erected, they were filled

with gypsum concrete. The double-pitched non-attic floor was made of prefabricated gypsum-reinforced concrete beams with a span of 3.3 m, based on prefabricated girders with a section of 200x400 mm. The simplicity and lightness of individual elements and structures made it possible to assemble the walls and ceilings of such a house in 24 hours.

It is possible to ensure a successful combination of the positive qualities of the wall material, as well as to avoid a number of disadvantages of traditional construction technologies, using building or high-strength gypsum as a binder for lightweight concrete. A significant advantage of such concretes is their low cost compared to cement concretes, which is due to low energy consumption.

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In the first variant, water resistance and strength increase due to the formation of Portland cement (PC) hydration products during hardening and the binding of a significant part of calcium hydroxide, the product of hydration of PC silicate phases, into low-basic calcium hydrosilicates C-S-H (I). The C-S-H phase contributes to increasing the strength and ensuring sufficient water resistance of products based on GCPV, solving the problem of obtaining full-fledged products for exterior walls.

Such a binder also retains an important property of purely gypsum binders - a quick set of initial strength, sufficient for early stripping (removal) of products after 1–2 hours of natural hardening. The binder will harden over time and improve the water resistance of products to a softening factor of 0.55–0.7.

The most important component of HCPV is the pozzolanic additive. As is known, the combination of gypsum binders with Portland cement causes softening or destruction of the hardening structure over time due to the formation of a trisulfate form of calcium hydrosulfoaluminate (ettringite) during the interaction of highly basic calcium hydroaluminates and calcium sulfates. This reaction is dangerous at the stage of hardening, when the rigidity and strength of the structure have already formed, since the formation of ettringite occurs with a significant increase in the volume of the solid phase by 2–3 times [1–4].

The use of expanded clay concrete in comparison with ordinary concrete gives a noticeable gain in many areas. When erecting walls, more than two times less mortar is required, the installation speed is increased by 4-5 times, and the mass of products per square meter of masonry is reduced by one and a half times.

One of the advantages of the material is its high thermal insulation properties, which makes it preferred for use in both warm and cold climates.

Expanded clay "breathes", regulating the humidity in the room. Buildings made of expanded clay concrete blocks are practically eternal and do not require maintenance. The material does not rot, does not burn and does not rust, having the positive properties of wood and stone at the same time.

Expanded clay concrete has good thermal insulation properties. Various tests of expanded clay gravel, which is an aggregate, carried out by specialized research institutes, have shown that its use can reduce heat loss by more than 75%.

Expanded clay concrete blocks are adapted to cold climates, environmentally friendly, architecturally expressive. The variety of shapes and textures gives freedom in creativity. Claydite concrete facades, as a rule, do not require external finishing and are perfectly combined with various decorative elements - forged gratings, metal and wood decorations.

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Expanded clay concrete is widely used in construction. Increasingly, piece materials from expanded clay concrete, aerated concrete, foam concrete are used. Among them, the first one is the most widespread. Expanded clay concrete has greater strength and less water absorption. Foam concrete and aerated concrete have lower strength, but also lower thermal conductivity, which increases significantly with increased humidity or water saturation of the material. Customers, as a rule, prefer expanded clay concrete, based on its ability to better withstand moisture [5].

But expanded clay concrete also has disadvantages such as poor moisture resistance and insufficient strength with some technological solutions.

To partially reduce the impact of shortcomings during their operation, scientists Goryachev D.E., and Kramarenko A.V. proposed to use gypsum-cement-pozzolanic binder (HPCV) with magnesia cement as an additive in expanded clay concrete. As a result of the research, it was noticed that the increase in the strength characteristics of expanded clay concrete when using this additive. The obtained samples showed a slight decrease in thermal conductivity and a slight change in water absorption to the level of expanded clay concrete without additives, however, these shortcomings are covered by an increase in frost resistance and strength of the sample due to the properties of magnesia cement. Increased strength characteristics for compression and bending, as well as the complete absence of shrinkage in concrete based on them, wear resistance, environmental friendliness of the composition, bactericidal properties. Thanks to the use of gypsum-cement-pozzolanic binders with magnesia cement, it is possible to almost completely abandon the heat and moisture treatment of materials, which, of course, will reduce material costs for manufacturing [6].

Kramarenko Arkady Viktorovich and Putilova Margarita Nikolaevna proposed a method for improving the strength of expanded clay concrete by adding phosphorus slag to it, and analyzed the physical and technical characteristics for comparison with analogues.

On the basis of the obtained data, it is possible to assume the prospect of using the obtained new material.This sample showed a slight increase in thermal conductivity and a slight change in water absorption to the level of expanded clay concrete without additives, however, these shortcomings are covered by an increase in frost resistance and strength of the sample due to the properties of the phosphorus binder. Increased strength characteristics for compression and bending, as well as the complete absence of shrinkage in concrete based on them. Thanks to the use of phosphorus-slag binders with clinker, it is possible to almost completely abandon the heat and moisture treatment of materials, which, of course, will reduce materials manufacturing costs [7].

Expanded clay concrete is widely used in construction. Increasingly, piece materials from expanded clay concrete, aerated concrete, foam concrete are used. The use of a gypsum-cement-pozzolanic binder based on magnesia cement and a phosphorus-slag binder as an additive in expanded clay concrete is rational and is a promising direction in which further research and experiments should be carried out.

Список литературы

1. Волженский А.В., Коган Г.С., Арбузов Н.Г. Гипсобетонные панели для перегородок и внутренней облицовки наружных стен. М.: Госиздат по строительным материалам, 1955. 185 с.
2. Волженский А.В. Минеральные вяжущие вещества. М.: Стройиздат, 1986. 464 с.
3. Бутт Ю.М., Сычев М.М., Тимашев В.В. Химическая технология вяжущих материалов. М.: Высшая школа, 1980. 472 с.
4. Алкснис Ф.Ф.Твердение и деструкция гипсоцементных композиционных материалов. Л.: Стройиздат, Ленинградское отделение, 1988. 103 с.
5. Нарышкина М.Б. Стеновые материалы на основе композиционного гипсового вяжущего: диссертация на соискание ученой степени кандидата технических наук. Белгород. 2010 г.
6. Горячев Д.Е., & Крамаренко А.В. (2017). Керамзитобетон с добавкой гипсоцементно-пуццоланового вяжущего на основе магнезиального цемента. Инновационная наука, (5), 50-52.
7. Крамаренко Аркадий Викторович, & Путилова Маргарита Николаевна (2017). Керамзитобетон с добавкой фосфорного шлака автоклавного закаливания. Символ науки, (5), 203-206.
8. Саттаров, З. М., & Холмирзаев, С. Т. (2014). Производство строительных материалов с использованием промышленных отходов.
9. Sattorov, Z. M. Research on phosphogips waste utilization in the building materials industry / Z. M. Sattorov, V. Sh. Mamatov // Инвестиции, градостроительство, недвижимость как драйверы социально-экономического развития территории и повышения качества жизни населения : материалы XII Международной научно-практической конференции, Томск, 01–04 марта 2022 года. – Томск: Томский государственный архитектурно-строительный университет, 2022. – P. 80-91. – EDN QPQZKB.

10. Отажонов, О. А. Влияние золы на характеристики и долговечность бетона / О. А. Отажонов, З. М. Сатторов // Актуальные проблемы строительства, ЖКХ и техносферной безопасности : Материалы IX Всероссийской (с международным участием) научно-технической конференции молодых исследователей, Волгоград, 18–23 апреля 2022 года. – Волгоград: Волгоградский государственный технический университет, 2022. – С. 190-194. – EDN SPZFPW.
11. Абдукадиров, Ф. Б., Саттаров, З. М., & Муродов, Б. З. (2021, April). НОВЫЕ ОГНЕ- И ТЕРМОСТОЙКИЕ ФОСФОНИЕВЫЕ ПОЛИМЕРЫ. In *Организационный комитет конференции* (Vol. 7, p. 12).
12. Сатторов, З. М. Эффективный способ утилизации отходов нефтегазовой промышленности / З. М. Сатторов, Б. З. Муродов // Современные технологии в нефтегазовом деле – 2021 : Сборник трудов международной научно-технической конференции, Октябрьский, 26 марта 2021 года. – Уфа: Уфимский государственный нефтяной технический университет, 2021. – С. 696-698. – EDN GGEPLS.
13. Исмаилов, О. Ю. Влияние гидродинамических режимов движения нефтегазоконденсатных потоков на толщину вязкого пограничного слоя и эффективностьтеплообмена / О. Ю. Исмаилов, З. М. Сатторов // Нефтепереработка и нефтехимия. Научно-технические достижения и передовой опыт. – 2020. – № 2. – С. 35-37. – EDN YXVRYW.
14. Сатторов, З. М. Методы исследования вспучивания вермикулита от технологических факторов / З. М. Сатторов // Актуальные проблемы строительства, ЖКХ и техносферной безопасности : Материалы VII Всероссийской (с международным участием) научно-технической конференции молодых исследователей, Волгоград, 20–25 апреля 2020 года / Под общей редакцией Н.Ю. Ермиловой, И.Е. Степановой. – Волгоград: Волгоградский государственный технический университет, 2020. – С. 450-452. – EDN IMRLUU.
15. Сатторов, З. М. Методы исследования влияния параметров термообработки пенополистирола на его плотность / З. М. Сатторов // Актуальные проблемы строительства, ЖКХ и техносферной безопасности : Материалы VII Всероссийской (с международным участием) научно-технической конференции молодых исследователей, Волгоград, 20–25 апреля 2020 года / Под общей редакцией Н.Ю. Ермиловой, И.Е. Степановой. – Волгоград: Волгоградский государственный технический университет, 2020. – С. 448-450. – EDN CJZVRN.
16] Сатторов, З. М. Классификация современных дробилки ударного действия для измельчения материалов / З. М. Сатторов // Социально-экономическое развитие городов и регионов: градостроительство, развитие бизнеса, жизнеобеспечение города : материалы III Международной научно-практической конференции, Волгоград, 09 января – 20 2018 года / Волгоградский государственный технический университет. – Волгоград: Волгоградский государственный технический университет, 2018. – С. 499-506. – EDN JTEBVL.
17. Самигов, Н. А. Исследование влияния на физико-химическое структурообразование цементной композиции с комплексной химической добавкой КДж-4 / Н. А. Самигов, М.

Т. Турапов, З. М. Сатторов // Социально-экономическое развитие городов и регионов: градостроительство, развитие бизнеса, жизнеобеспечение города : материалы III Международной научно-практической конференции, Волгоград, 09 января – 20 2018 года / Волгоградский государственный технический университет. – Волгоград: Волгоградский государственный технический университет, 2018. – С. 512-521. – EDN QBGMMD.
18. Сатторов, З. М. Ресурсы и ресурсные материалы / З. М. Сатторов // Актуальные проблемы строительства, ЖКХ и техносферной безопасности : Материалы IV Всероссийской научно-технической конференции молодых исследователей (с международным участием), Волгоград, 24–20 апреля 2017 года / Под общей редакцией Н.Ю. Ермиловой. – Волгоград: Волгоградский государственный технический университет, 2017. – С. 70-72. – EDN THBNCH.
21. Бахромов, М. М., Отакулов, Б. А., & Рахимов, Э. Х. У. (2019). Определение сил негативного трения при оттаивании околосвайного грунта. European science, (1 (43)).
22. Абдукаримов, Б. А., Отакулов, Б. А., Рахмоналиев, С. М. У., & Муродалиева, Н.А. К. (2019). Способы снижения аэродинамического сопротивления калориферов в системе воздушного отопления ткацких производств и вопросы расчета их тепловых характеристик. Достижения науки и образования, (2 (43)).
23. Юсупов, А. Р., Милладжонова, З. Р., Отакулов, Б. А., & Рахимов, Э. Х. У. (2019). К расчёту неравнопрочных термогрунтовых тел на сдвигающие нагрузки. Достижения науки и образования, (2 (43)).
24. Мирзажонов, М. А., & Отакулов, Б. А. (2018). ВЛИЯНИЕ НА ПРОЧНОСТЬ КОНТАКТНОЙ ЗОНЫ РАБОЧЕГО СТЫКА ВРЕМЕНИ ВЫДЕРЖКИ НОВОГО БЕТОНА. In XLIII INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE" INTERNATIONAL SCIENTIFIC REVIEW OF THE PROBLEMS AND PROSPECTS OF MODERN SCIENCE AND EDUCATION" (pp. 22-24).
25. Мирзажонов, М. А., & Отакулов, Б. А. (2018). Восстановление разрушенных частей бетонных и железобетонных конструкций. Достижения науки и образования, (13 (35)).
26. Xalimjon o'gli, S. J. (2021). INFLUENCE ON DURABILITY OF CONTACT ZONE OF WORKING JOINT TIME OF THE ENDURANCE OF A NEW CONCRETE. EPRA International Journal of Environmental Economics, Commerce and Educational Management, 8(5), 1-2.
27. Otakulov, B. A., Karimova, M. I. Q., & Abdullayev, I. A. (2021). Use of mineral wool and its products in the construction of buildings and structures. Scientific progress, 2(6),1880-1882.
28. Otakulov, B. A., Abdullayev, I. A., & Sultonov, K. S. O. (2021). RAW MATERIAL BASE OF CONSTRUCTION MATERIALS AND USE OF INDUSTRIAL WASTE. Scientific progress, 2(6), 1609-1612.
29. Tulaganov, A., Hodjaev, S., Sultanov, A., Tulaganov, B., Otakulov, B., Hodjaev, N., & Abdasov, D. (2021). FESTIGKEITSBESCHREIBUNG DES SCHWERBETONS AUF ALKALISCHLACKEN–BINDEMITTEL. The Scientific-Practice Journal of Architecture, Construction and Design, 1(1), 5.

30. Abobakirovich, A. B., Adhamovich, O. B., Ugli, M. B. I., & Qizi, M. N. A. (2019). Increasing the efficiency of solar air heaters in free convection conditions. Достижения науки и образования, (2 (43)).67
31. Abdukarimov, B. A., Otakulov, B. A., Mahsitaliyev, B. I., & Murodaliyeva, N. A. (2019). INCREASING THE EFFICIENCY OF SOLAR AIR HEATERS IN FREE CONVECTION CONDITIONS. Достижения науки и образования, (2), 26-27.
32. Otakulov, B. A., Abdullayev, I. A., & Toshpulatov, J. O. O. (2021). IMPORTANCE OF HEAT-RESISTANT CONCRETE IN CONSTRUCTION. Scientific progress, 2(6), 1613-1616.
33. Otakulov, B. A., Isoyev, Y. A., & Salimjonov, J. H. O. G. L. (2021). ABOUT MONOLITHIC REINFORCED CONCRETE STRUCTURES IN CONSTRUCTION. Scientific progress, 2(7), 722-724.
34. Otakulov, B. A., Isoyev, Y. A., & Salimjonov, J. H. O. G. L. (2021). THE SCIENCE OF BUILDING MATERIALS TAKES PLACE IN ARCHITECTURE. Scientific progress, 2(7), 725-727.
35. Otakulov, B. A., Isoyev, Y. A., & Salimjonov, J. H. O. G. L. (2021). WAYS TO SAVE CERAMICS AND FIRE BUILDING MATERIALS. Scientific progress, 2(7), 718-721.
36. Otakulov, B. A., Isoyev, Y. A., & Sailimjonov, J. X. O. G. L. (2021). IMPROVING THE EARTHQUAKE RESISTANCE AND HEAT RESISTANCE OF BUILDINGS BUILT OF MODERN ENERGY-SAVING MATERIALS. Scientific progress, 2(7), 117-120.
37. Otakulov, B. A., Karimova, M. I. Q., & Abdullayev, I. A. (2021). Improving the durability of asphalt-concrete. Scientific progress, 2(7), 121-124.
38. Solijon o'g'li, S. H. (2021). ANALYSIS OF COMPOSITIVE ARMATURES. EPRA International Journal of Multidisciplinary Research, 7(5), 494-496.
39. Adhamovich, O. B., & Saydi-axmadovich, Y. B. J. EFFECT OF POLYMERY MONOMORES ON THE STRENGTH OF OLD AND CONCRETE CONCRETES.
40. Otakulov, B. A., Sobirova, D. T., & Yokubova, M. T. Q. (2021). RAW MATERIALS AND OPTIMAL COMPOSITIONS FOR NEW GENERATION CELLULAR CONCRETE. Scientific progress, 2(8), 473-478.
41. Otakulov, B. A., Kodirov, B. X., & Solijonov, H. S. O. G. L. (2021). SELECTING THE OPTIMAL BITUMEN CONTENT. Scientific progress, 2(8), 415-420.
42. Otakulov, B. A., Kodirov, B. X., & Solijonov, H. S. O. G. L. (2021). ASPHALT CONCRETE PREPARATION TECHNOLOGY. Scientific progress, 2(8), 421-425.
43. Otakulov, B. A., Kodirov, B. X., & Solijonov, H. S. O. G. L. (2021). CALCULATING THE COMPOSITION OF THE MINERAL PART. Scientific progress, 2(8), 403-408.
44. Otakulov, B. A., Sobirova, D. T., & Yokubova, M. T. Q. (2021). FACTORS THAT REDUCE THE HEAT-SHIELDING PROPERTIES OF ENCLOSING STRUCTURES. Scientific progress, 2(8), 479-485.
45. Otakulov, B. A., Kodirov, B. X., & Solijonov, H. S. O. G. L. (2021). ASSESSMENT OF THE QUALITY OF SOURCE MATERIALS FOR ASPHALT CONCRETE. Scientific progress, 2(8), 396-402.

46. Otakulov, B. A., Kodirov, B. X., & Solijonov, H. S. O. G. L. (2021). DETERMINATION OF ASPHALT CONCRETE COMPOSITION. Scientific progress, 2(8), 409-414.
47. Otakulov, B. A., & Madaminova, R. G. Q. (2021). WORKING JOINTS OF MONOLITHIC AND PREFABRICATED STRUCTURES AND METHODS OF 68 OVERCOMING THEIR NEGATIVE CONSEQUENCES. Scientific progress, 2(8),731-734.
48. Adhamovich, O. B., Nabijonovich, A. N. M., & Madaminova, R. G. Q. (2021). THE ROLE OF MONOLITHIC REINFORCED CONCRETE CONSTRUCTION IN MODERN CONSTRUCTION. Scientific progress, 2(8), 735-739.
49. Khomidjonovich, K. B. (2021). Lock Paint Materials. International Journal ofDiscoveries and Innovations in Applied.