Electron Microscopic Analysis of Modified Foam Concrete

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ABSTRACT

The article presents the results of the physico-chemical analysis of the microstructure of foam concrete with the KDz-3ChMB complex chemical additive and the variable hydration and crystallization processes of cement stone using electron microscopic images. It was found that these additives in cement stone contribute to the emergence of new formations, crystallization in a thin dispersed medium, stitching of the capillaries and pores of Portland cement stone, densification and strengthening of its structure.

Keywords:	electron microscopy, calcium hydroxide, calcium hydroaluminate, complex additives, crystals, cement, ettringite foam concrete.

The phase composition of hydrate neoplasms of foam concrete was studied by electron microscopy using portland cement of the Kuvasoycement plant PTs400 D20 with different compositions of complex additives.

As the amount of calcium hydroxide decreases, the likelihood of formation and presence of polybasic calcium hydroaluminates decreases. This situation prevents the formation of GSAK during further solidification. Neoplasms formed by crystallization in the presence of fine complex inclusions fill the pores and capillaries of portland cement stone, compress and strengthen its structure [1,2].

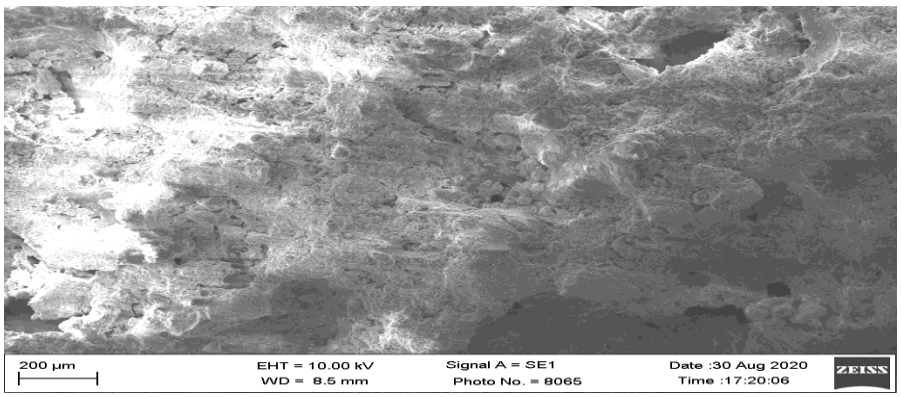

Figure 1. Electron microscopic images of a sample of foam concrete without additives

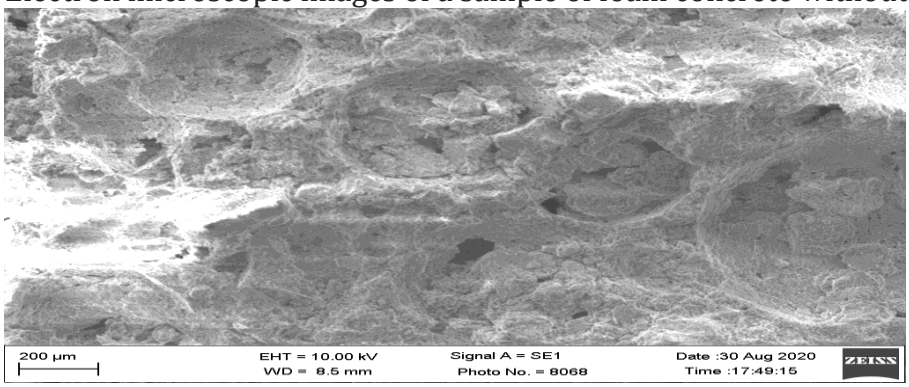

Figure. 2 Electron microscopic images of a sample of foam concrete with 8% addition of KDj-3TsMB cement mass

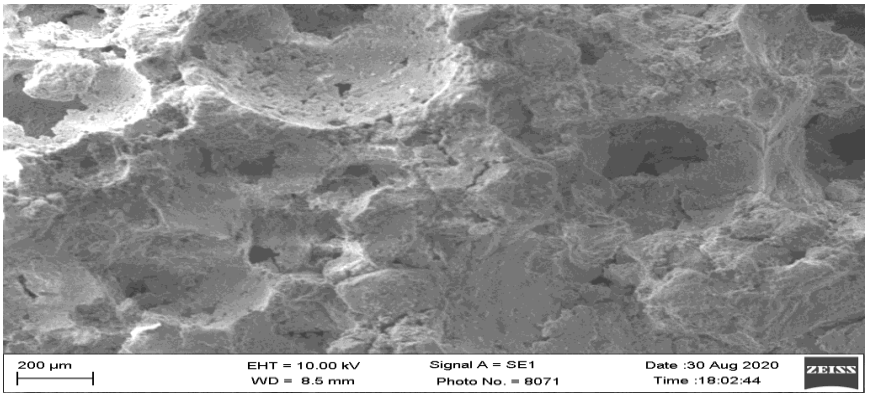

Figure. 3 Electron microscopic images of a sample of foam concrete with 10% addition of KDj-3TsMB cement mass

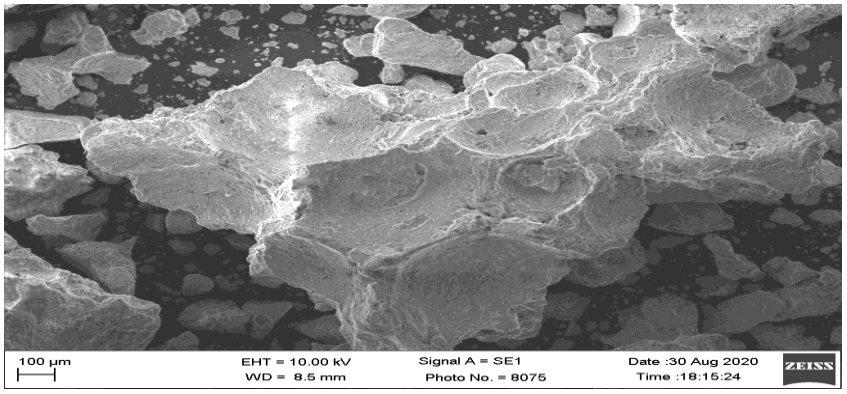

Figure. 4 Electron microscopic images of a sample of foam concrete with 12% addition of KDj-3TsMB cement mass.

Needle-shaped ettringite crystals are observed in the main gel-like mass of neoplasms, filling free spaces. Ettringite growth is formed in the free volume. In the electron microphotographs

of foam concrete samples with added complex additive KDj-3TsMB, it is observed that gypsum and calcium hydrosulfoaluminate also fill the pores. In addition, when complex additives are added, the amount of hydrosulfoaluminate is dominant. [3,4] An increase in the concentration of calcium hydrosulfoaluminate and an increase in the specific surface of the hydrate phases both in the general structure of foam concrete and in the defective areas of the spatial skeleton lead to the hardening of the material. At the initial stages of solidification, compacting and strengthening the structure of portland cement compositions, when complex additives are added, gypsum and calcium hydrosulfoaluminate also crystallize with increasing volume [5,6].

Summary.

1. The development and application of multi-functional complex additive KDj-3ChMB in cement stone in the amount of 8, 10 and 12% of the cement mass helps to reduce the water-related extiogenity of cement stone by 10 and 15%, respectively, and helps to increase the strength of cement stone by 25 and 30%.
2. Different compositions of cement stone with KDz-3ChMB added, in the amount of 10% of the cement mass, were studied experimentally. After studying only 1 composition, the use of the additive helps to reduce the water resistance of the cement stone by 10-15% and increase its strength by 25% compared to the control samples.

Referenses

1. Абдукаримов Бекзод Абобакирович, Отакулов Бахромжон Адхамович, Рахмоналиев Санжарбек Мухаммаджон Угли, & Муродалиева Нилуфар Авазбек Кизи (2019). Способы снижения аэродинамического сопротивления калориферов в системе воздушного отопления ткацких производств и вопросы расчета их тепловых характеристик. Достижения науки и образования, (2 (43)), 28-33.
2. Alimovich, M. M., Abdullaevich, M. H. (2022). Investigation of the Effect of Plasticizers on the Properties of Binders Based on Gypsum-Containing Waste. Journal of Architectural Design, 6, 1-4
3. Абдимоминов, И. И., Орипов, З. Б., Арисланов, А. С., Пахратдинов, А.А., Маматов, Х.А., & Рўзметов, Ф.Ш. (2022). Шаҳар магистрал кўчаларининг транспорт-эксплуатацион ҳолатини транспорт шовқинига таъсирини баҳолаш ва прогнозлаш (Тошкент шаҳри мисолида). Образование, 8(9)
4. Mirzajonov Mamurjon Alimovich, Mamatov Xamidulla Abdullayevich, Karimova Mukhtasar Isroiljon kizi In volume 6, of Journal of Architectural Design (JAD) May, 2022 ISSN (E): 2795-7608
5. X.A. Mamatov, Vliyanie keramzita na svoystva penobetona Ekanoma I sotsium ISSN: 2225-1545 Vol.4, No 4(94), 2022
6. Mamatov Xamidulla Abdullyevich. (2022). Physical and mechanical properties cement stone with chemical additive kdj-3.*Spectrum Journal of Innovation, Reforms and Development*, *9*, 308–313. Retrieved from
7. Mamatov Xamidulla Abdullyevich, & Sabirova Dilfuza Tillavaldievna. (2022). Prospects for the production of new generation makeup products in the republic. *Spectrum Journal of Innovation, Reforms and Development*, *9*, 296–301. Retrieved from
8. Mamatov Xamidulla Abdullyevich, & Sabirova Dilfuza Tillavaldievna. (2022). Optimal compositions for local cellular concrete raw materials. *Spectrum Journal of Innovation, Reforms and Development*, *9*, 290–295. Retrieved from
9. Х.А. Маматов, З.Б. Махмудов Влияние зола унос на свойства пенобетона SCIENTIFIC PROGRESS

VOLUME 3 | ISSUE 7| 2022 ISSN: 2181-1601 Scientific Journal Impact Factor (SJIF 2022=5.016) Passport: htt Page 1 SCIENTIFIC PROGRESS VOLUME 3

10. Samigov N.A., Karimov M.U., Mamatov X.A. Physicochemical Structure And Properties Of Cement Stones With A Complex Chemical Additive KDj-3CHMB.| The American Journal of Engineering and Technology (ISSN – 2689-0984 Published: April 25, 2021 | Pages: 42-53 Doi: https://doi.org/10.37547/tajet/Volume03Issue04-07
11. ХА Маматов, УМ Абдуллаев, Заполнители для шлакощелочных легких бетонов Vol. 1 No. 5 (2022): Innovative Development in Educational Activities (IDEA) 31-38
12. Маматов Хамидулла Абдуллаевич, Влияние керамзита на свойства пенобетона, Экономика и социум 4 (4), 2022/4 1-5
13. Бахромов Махмуд Маматхонович, Отакулов Бахром Адхамович, & Рахимов Элбек Хасанбой Угли (2019). Определение сил негативного трения при оттаивании околосвайного грунта. European science, (1 (43)), 22-25.
14. Bakhromjon Adhamovich Otakulov, Muxtasar Isrolijon Qizi Karimova, & Ikromjon Aminjonovich Abdullayev (2021). USE OF MINERAL WOOL AND ITS PRODUCTS IN THE CONSTRUCTION OF BUILDINGS AND STRUCTURES. Scientific progress, 2 (6), 1880-1882.
15. Юсупов Абдулхамид Рахмонбердиевич, Милладжонова Зулхумор Рахматовна, Отакулов Бахромжон Адхамович, & Рахимов Элбек Хасанбой Угли (2019). К расчёту неравнопрочных термогрунтовых тел на сдвигающие нагрузки. Достижения науки и образования, (2 (43)), 22-23.
16. Мирзажонов Мамур Алимович, & Отакулов Бахром Адхамович (2018). Восстановление разрушенных частей бетонных и железобетонных конструкций. Достижения науки и образования, (13 (35)), 13-14.
17. 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.
18. Bakhromjon Adhamovich Otakulov, Ikromjon Aminjonovich Abdullayev, & Khumoyun Sharifjon Ogli Sultonov (2021). RAW MATERIAL BASE OF CONSTRUCTION MATERIALS AND USE OF INDUSTRIAL WASTE. Scientific progress, 2 (6), 1609-1612.
19. 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.
20. Abdukarimov Bekzod Abobakirovich, Otakulov Bahrom Adhamovich, Mahsitaliyev Barhayot Iftihorjon Ugli, & Murodaliyeva Nilufar Avazbek Qizi (2019). Increasing the efficiency of solar air heaters in free convection conditions. Достижения науки и образования, (2 (43)), 26-27.
21. Bakhromjon Adhamovich Otakulov, Ikromjon Aminjonovich Abdullayev, & Jurabek Otabek Oglu Toshpulatov (2021). IMPORTANCE OF HEAT-RESISTANT CONCRETE IN CONSTRUCTION. Scientific progress, 2 (6), 1613-1616.
22. Bakhromjon Adhamovich Otakulov, Yusufjon Amonovich Isoyev, & Jasurbek Halimjon O'G'Li Salimjonov (2021). ABOUT MONOLITHIC REINFORCED CONCRETE STRUCTURES IN CONSTRUCTION. Scientific progress, 2 (7), 722-724.
23. Bakhromjon Adhamovich Otakulov, Yusufjon Amonovich Isoyev, & Jasurbek Halimjon O'G'Li Salimjonov (2021). WAYS TO SAVE CERAMICS AND FIRE

BUILDING MATERIALS. Scientific progress, 2 (7), 718-721.
24. Bakhromjon Adhamovich Otakulov, Yusufjon Amonovich Isoyev, & Jasurbek Halimjon O'G'Li Salimjonov (2021). THE SCIENCE OF BUILDING MATERIALS TAKES PLACE IN ARCHITECTURE. Scientific progress, 2 (7), 725-727.
25. Bakhromjon Adhamovich Otakulov, Yusufjon Amonovich Isoyev, & Jasurbek Xalimjon O'G'Li Sailimjonov (2021). IMPROVING THE EARTHQUAKE RESISTANCE AND HEAT RESISTANCE OF BUILDINGS BUILT OF MODERN ENERGY-SAVING MATERIALS. Scientific progress, 2 (7), 117-120.
26. Bakhromjon Adhamovich Otakulov, Muxtasar Isrolijon Qizi Karimova, & Ikromjon Aminjonovich Abdullayev (2021). IMPROVING THE DURABILITY OF ASPHALT-CONCRETE. Scientific progress, 2 (7), 121-124.
27. Bakhromjon Adhamovich Otakulov, Dilfuza Tillavoldiyevna Sobirova, & Madinakhon Tolib Qizi Yokubova (2021). RAW MATERIALS AND OPTIMAL COMPOSITIONS FOR NEW GENERATION CELLULAR CONCRETE. Scientific progress, 2 (8), 473-478.
28. Otakulov Bakhromjon Adhamovich, Abduganiyev Nu'Monjon Nabijonovich, & Risolatkhon Gayratjon Qizi Madaminova (2021). THE ROLE OF MONOLITHIC REINFORCED CONCRETE CONSTRUCTION IN MODERN CONSTRUCTION. Scientific progress, 2 (8), 735-739.
29. Bakhromjon Adhamovich Otakulov, Nu'Monjon Nabijonovich Abduganiyev, & Risolatkhon Gayratjon Qizi Madaminova (2021). WORKING JOINTS OF MONOLITHIC AND PREFABRICATED STRUCTURES AND METHODS OF OVERCOMING THEIR NEGATIVE CONSEQUENCES. Scientific progress, 2 (8), 731-734.
30. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). SELECTING THE OPTIMAL BITUMEN CONTENT. Scientific progress, 2 (8), 415-420.
31. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). ASPHALT CONCRETE PREPARATION TECHNOLOGY. Scientific progress, 2 (8), 421-425.
32. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). CALCULATING THE COMPOSITION OF THE MINERAL PART. Scientific progress, 2 (8), 403-408.
33. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). ASSESSMENT OF THE QUALITY OF SOURCE MATERIALS FOR ASPHALT CONCRETE. Scientific progress, 2 (8), 396-402.
34. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). DETERMINATION OF ASPHALT CONCRETE COMPOSITION. Scientific progress, 2 (8), 409-414.
35. Bakhromjon Adhamovich Otakulov, Dilfuza Tillavoldiyevna Sobirova, & Madinakhon Tolib Qizi Yokubova (2021). FACTORS THAT REDUCE THE HEAT-SHIELDING PROPERTIES OF ENCLOSING STRUCTURES. Scientific progress, 2 (8), 479-485.
36. Tulaganov, A., Hodjaev, S., Sultanov, A., Tulaganov, B., Otakulov, B., Hodjaev, N., & Abdasov, D. (2021). FESTIGKEITSBESCHREIBUNG DES SCHWERBETONS.
37. Bakhromjon Adhamovich Otakulov, Dilfuza Tillavoldiyevna Sobirova, & Madinakhon Tolib Qizi Yokubova (2021). INFLUENCE OF DRY AND HOT CLIMATE ON CONCRETE AND REINFORCED CONCRETE STRUCTURES. Scientific progress, 2 (8), 486-489.
38. Бахромов, М. М. Отакулов Бахром Адхамович, & Рахимов Элбек Хасанбой Угли (2019). Определение сил негативного трения при

оттаивании околосвайного грунта. European science,(1 (43)), 22-25.
39. Мирзажанов, М. А., & Отакулов, Б. А. Бетон ва темирбетон конструкция-ларининг ишчи чоклари муста^ камлигига таъсир этувчи факторлар. ФерПИ научно-технический журнал, 21.
40. Mirzaev B., Otakulov B., Mamatov K., Otajonov O. Research of physical-mechanical and physicalchemical properties of expanded direction concrete with complex polymer – mineral additive of a new generation based on local raw materials //E3S Web of Conferences. – EDP Sciences, 2023. – T. 452.
41. Research of physical-mechanical and physical-chemical properties of expanded direction concrete with complex polymer - mineral additive of a new generation based on local raw materials Bakhodir Mirzaev, Bakhromjon Otakulov, Khamidulla Mamatov and Olmosbek Otajonov E3S Web of Conf., 452 (2023) 06002 DOI: https://doi.org/10.1051/e3sconf/202345206002
42. Gypsum binders based on ceramic industry waste Mamurjon Mirzajanov, Bakhromjon Otakulov, Shoirjon Kuziboev, Bakhodir Mirzaev, Adkhamjon Khamidov and Zokhidjon Abdulkhaev E3S Web of Conf., 452 (2023) 06015 DOI: https://doi.org/10.1051/e3sconf/202345206015
43. Flow trajectory analysis and velocity coefficients for fluid dynamics in tubes and holes Zokhidjon Abdulkhaev, Mamadali Madraximov, Shairakhon Abdujalilova, Saxiba Mirzababayeva, Bakhromjon Otakulov, Abdusalom Sattorov and Zuhriddin Umirzakov E3S Web of Conf., 452 (2023) 02010 DOI: https://doi.org/10.1051/e3sconf/202345202010
44. Mirzajanov, M. A., M. M. Ergashev, and B. A. Otakulov. "Steam structure and thermal conductivity of lightweight concrete aggregate." E3S Web of Conferences. Vol. 401. EDP Sciences, 2023.
45. Otakulov B.A. (2022). AERABLE CONCRETE AND MODERN FACING MATERIALS AND PRODUCTS BASED ON THEM. Экономика и социум, (11-1 (102)), 1125-1127.
46. Otakulov B.A. (2022). WALL DESIGNS AND THEIR HEATING AND TECHNICAL INDICATORS OF MODEL HOUSES BUILT INDIVIDUALLY. Экономика и социум, (4-1 (95)), 130-133.
47. Otakulov B.A., & Ismoiljonova M.M. (2022). USE OF BINDERS IN CONSTRUCTION. Экономика и социум, (4-2 (95)), 373-375.
48. B. A. Otakulov, & Z. B. Mahmudov (2022). OPERATION OF BUILDINGS ON SEDIMENTARY SOILS. Scientific progress, 3 (7), 104-107.
49. B. A. Otakulov, & Z. B. Mahmudov (2022). TECHNICAL OPERATION OF BUILDINGS IN SEISMIC REGIONS. Scientific progress, 3 (7), 99-103.
50. Otakulov B.A., Abdurasulova N.Sh., & Xaydarov J.O. (2022). IMPORTANCE OF SULPHATE-RESISTANT PORTLAND CEMENT IN CONSTRUCTION. Экономика и социум, (5-1 (96)), 161-163.
51. Bakhromjon Adhamovich Otakulov, & Khumoyun Sharifjon O‘Gli Sultonov (2022). FACTORS AFFECTING THE QUALITY OF CONCRETE AGGREGATES. Scientific progress, 3 (3), 616-620.
52. Bakhromjon Adhamovich Otakulov, & Khumoyun Sharifjon O‘Gli Sultonov (2022). EXPLOITATION OF EXPANDED CLAY IN CONSTRUCTION. Scientific progress, 3 (3), 621-624.
53. Bakhromjon Adhamovich Otakulov, & Ulug’Bek Maxmudovich Abdullayev (2022). INCREASING THE DURABILITY OF STRUCTURAL ELEMENTS OF TANKS FOR WATER USING COMPOSITE MATERIALS. Scientific progress, 3 (3), 358-361.
54. Ergashev M.M., & Otakulov B.A. (2021). ABOUT THE USE OF WOLLASTONITE

AGGREGATE CONCRETE. Экономика и социум, (11-1 (90)), 180-183.
55. Otakulov B.A., & Abdullayev U.M. (2021). HISTORY OF FOAM CONCRETE PRODUCTION DEVELOPMENT. Экономика и социум, (12-1 (91)), 485-488.
56. Ergashev M.M., & Otakulov B.A. (2021). USE OF VERMICULITE FOAMED WITH THERMAL INSULATION MATERIAL. Экономика и социум, (11-1 (90)), 173-175.
57. Otakulov B.A., & Abdullayev U.M. (2021). IMPROVING THE SORBTION PROPERTIES OF SALT UNDERWAY. Экономика и социум, (12-1 (91)), 482-484.
58. Ergashev M.M., & Otakulov B.A. (2021). USE OF ALKALINE CEMENT OBTAINED WITHOUT BURNING IN CONSTRUCTION. Экономика и социум, (11-1 (90)), 176-179.
59. Adhamovich, B., Amonovich, Y., & Halimjon o'g'li, J. ABOUT MONOLITHIC REINFORCED CONCRETE STRUCTURES IN CONSTRUCTION.
60. Adhamovich, B., Amonovich, Y., & Halimjon o'g'li, J. THE SCIENCE OF BUILDING MATERIALS TAKES PLACE IN ARCHITECTURE.
61. Adhamovich, B. WORKING JOINTS OF MONOLITHIC AND PREFABRICATED STRUCTURES AND METHODS OF OVERCOMING THEIR NEGATIVE CONSEQUENCES Bakhromjon Adhamovich Otakulov.
62. Goncharova, N. I., Raxmanov, B. K., Mirzaev, B. K., & Xusainova, F. O. (2018). Properties of concrete with polymer additives-wastes products. Scientific-technical journal, 1(2), 149-152.
63. Kuzibaevich, M. B., & Nabijonovich, A. N. M. (2021). Analysis of study of physical and mechanical properties of vermiculite concrete with new generation complex chemical addition KDj-3. International Engineering Journal For Research & Development, 6(3), 5-5.
64. Mirzaev, B. K., & Mirzazhanov, M. A. (2022). PROPERTIES OF EXPANDED CLAY CONCRETE WITH COMPLEX POLYMER-MINERAL ADDITIVES. Экономика и социум, (4-1 (95)), 106-109.
65. Kozibaevich, M. B. (2022). THE EFFECT OF ADDITIVES THAT ACCELERATE SOLIDIFICATION ON THE MAIN PROPERTIES OF FOAM CONCRETE: CHANGES IN PHYSICAL AND MECHANICAL PROPERTIES. International Journal of Advance Scientific Research, 2(11), 67-76.
66. Мирзаев, Б. К., Собирова, Д. Т., & Умирдинов, И. О. (2021). Методы Повышения Физико-Механических Свойств Вермикулитного Бетона. Central Asian Journal of Theoretical and Applied Science, 2(12), 293-297.
67. Samigov, N. A., Djalilov, A. T., Karimov, M. U., Sattorov, Z. M., Samigov, U. N., & Mirzayev, B. Q. (2019). Physical and chemical researches of the relaxol series of cement composition with complex chemical additive KDJ-3. Scientific-technical journal, 23(4), 71-77.
68. Kozibaevich, M. B. (2021). Study of the effect of new synthesed complex chemical additions on rheological properties of portland cement. Innovative Technologica: Methodical Research Journal, 2(12), 133-137.
69. Kuziboevich, M. B. ., & Nabijonovich, A. N. . (2021). Results Of Studying The Physical And Mechanical Properties Of Polystyrene Concrete With Additional Complex Chemical Additive Kdj-3 Based On Local Raw Materials. The American Journal of Engineering and Technology, 3(06), 30–34.
70. Sattorov1, Z., Mirzayev, B., & Mamatov1, V. (2023). GIPS BLOKINI ISHLAB CHIQISH ORQALI CHIQINDILARNI UTILIZATSIYA QILISH VA ENERGIYA TEJAMKORLIKNI OSHIRISH. GOLDEN BRAIN, 1(1), 165–171. Retrieved from https://researchedu.org/index.php/goldenbrain/article/view/4530
71. Абдуллаев У.М., ., Абдуллаев И.Н., . (2021). Пути развития производства пенобетона. Американский журнал

техники и технологий , 3 (7), 9–14. Получено с https://inlibrary.uz/index.php/tajet/article/view/9867.
72. Bakhromjon Adhamovich Otakulov, & Ulug'Bek Maxmudovich Abdullayev (2022). INCREASING THE DURABILITY OF STRUCTURAL ELEMENTS OF TANKS FOR WATER USING COMPOSITE MATERIALS. Scientific progress, 3 (3), 358-361.
73. Otakulov B.A., & Abdullayev U.M. (2021). HISTORY OF FOAM CONCRETE PRODUCTION DEVELOPMENT. Экономика и социум, (12-1 (91)), 485-488.
74. Otakulov B.A., & Abdullayev U.M. (2021). IMPROVING THE SORBTION PROPERTIES OF SALT UNDERWAY. Экономика и социум, (12-1 (91)), 482-484.
75. Zh, N. U. (2022, April). WORKING PRINCIPLE OF A SOLAR CELL. In E Conference Zone (pp. 87-89).
76. Кулдашов, О. Х., & Нигматов, У. Ж. (2021). Автоматизированная система мониторинга температуры рабочей поверхности солнечных панелей. Автоматика и программная инженерия, (3 (37)), 108-111.
77. Ергашев, С. Ф., & Нигматов, У. Ж. (2021). Солнечные параболоцилиндрические установки, конструктивные особенности и расчет отдельных параметров. Журнал Сибирского федерального университета. Техника и технологии, 14(1), 33-41.
78. Ergashev, S. F., & Nigmatov, U. Z. (2021). Solar Parabolocilindrical Installations, Constructive Features and Calculation of Individual Parameters. Journal of Siberian Federal University. Engineering & Technologies, 14(1), 33-41.
79. Rakhimov, R. K., Irgashev, S. F., Abdurakhmanov, S. M., & Nigmatov, U. J. (2017). The automated computer system of measurement of productivity of solar water heaters from portion preparation of hot water. Computational nanotechnology, (1), 23-26.
80. Рахимов, Р. Х., Эргашев, С. Ф., Абдурахмонов, С. М., & Нигматов, У. Ж. (2017). Автоматизированная компьютерная система измерения производительности солнечных водонагревателей с порционной подготовкой горячей воды. Computational nanotechnology, (1), 23-26.
81. Эргашев, С. Ф., Нигматов, У. Ж., & Пулатов, Э. У. У. (2018). Анализ перепадов температур, возникающих в тепловых трубах солнечных параболоцилиндрических установок. Проблемы науки, (5 (29)), 18-21.
82. Эргашев, С. Ф., & Нигматов, У. Ж. (2020). Солнечные параболоцилиндрические установки, конструктивные особенности и расчёт отдельных параметров. Universum: технические науки, (11-5 (80)), 51-56.
83. Нигматов, У. Ж. (2020). Анализ конструктивных элементов охлаждения гибридных солнечных коллекторов. Вестник науки и образования, (2-3 (80)), 4-15.
84. Нигматов, У. Ж., & Наимов, Ш. Б. (2020). Анализ потенциала использования энергии солнечного излучения на территории республики Таджикистан. In International scientific review of the technical sciences, mathematics and computer science (pp. 59-71).
85. Эргашев, С. Ф., Нигматов, У. Ж., Орипов, А., & Ощепкова, Э. А. (2019). Энергоэффективный трекер без использования светозависимых датчиков (Фоторезисторов, фотодиодов и тд). Известия Ошского технологического университета, (3), 234-236.
86. Эргашев, С. Ф., Нигматов, У. Ж., Абдуганиев, Н. Н., & Юнусов, Б. С. А. (2018). Солнечные параболоцилиндрические электростанции-современное

состояние работ и перспективы использования их в народном хозяйстве Узбекистана. Достижения науки и образования, (5 (27)), 6-8.
87. Мирзаев, Б. К., Собирова, Д. Т., & Умирдинов, И. О. (2021). Методы Повышения Физико-Механических Свойств Вермикулитного Бетона. Central Asian Journal of Theoretical and Applied Science, 2(12), 293-297.
88. Umirdinov, I. O., & Solijonov, X. S. (2021). Prospects for the use of Polymer Composite Reinforcement in the Reinforcement of Concrete Structures in the Republic of Uzbekistan. American Journal of Social and Humanitarian Research, 2(9), 147-150.
89. Solijon o'g'li, S. H. (2023). MAHALLIY XOMASHYOLAR ASOSIDA OLINGAN YENGIL KERAMIK OLOVBARDOSH G 'ISHTNING TARKIBI VA TEXNOLOGIYASINI ISHLAB CHIQISH. Scientific Impulse, 1(10), 862-868.
90. Umirdinov, I. O. (2022). Foam Glass Lightweight Aggregate: The New Approach. Central Asian Journal of Theoretical and Applied Science, 3(11), 205-211.
91. Umirdinov I.O. (2022). SHISHA BETONNING TURLARI. Экономика и социум, (11-2 (102)), 243-248.
92. Umirdinov I.O. (2022). ASPHALT CONCRETE IN HOT-DRY CLIMATE CONDITIONS DEVELOPMENT DEFICIENCIES AND ITS ELIMINATION. Экономика и социум, (4-1 (95)), 182-184.
93. Umirdinov, I. O., & Solijonov, X. S. (2021). Prospects for the use of Polymer Composite Reinforcement in the Reinforcement of Concrete Structures in the Republic of Uzbekistan. American Journal of Social and Humanitarian Research, 2(9), 147-150.
94. Solijonov, X. S. (2022). USE IN THE INDUSTRY OF BUILDING MATERIALS OF ASH AND SLAG OF THERMAL POWER PLANTS. Экономика и социум, (4-1 (95)), 164-167.
95. Solijonov, X. S. (2022). USE IN THE INDUSTRY OF BUILDING MATERIALS OF ASH AND SLAG OF THERMAL POWER PLANTS. Экономика и социум, (4-1 (95)), 164-167.
96. 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.
97. 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.
98. Otakulov, B. A., Kodirov, B. X., & Solijonov, H. S. O. G. L. (2021). Determination of asphalt concrete composition. Scientific progress, 2(8), 409-414.
99. Otakulov, B. A., Kodirov, B. X., & Solijonov, H. S. O. G. L. (2021). Selecting the optimal bitumen content. Scientific progress, 2(8), 415-420.
100. Otakulov, B. A., Kodirov, B. X., & Solijonov, H. S. O. G. L. (2021). Selecting the optimal bitumen content. Scientific progress, 2(8), 415-420.
101. Кодиров, Б. Х. (2022). Изготовления топливных брикетов из листьев в домашних условиях сельской местности Республики Узбекистан. Academic research in educational sciences, 3(1), 335-339.
102. Абдуганиев Назиржон Набижонович, Мирзаева Гулчехра Сотволдиевна, & Абдуганиев Нумонжон Набижонович (2019). Пути интенсивности работы аэратенков с пневматической аэрацией. Universum: технические науки, (12-1 (69)), 5-