Brief information about the project

Name of the project	AP19680588 «Development of hybrid floor coverings with increased wear resistance»
Relevance	The idea of the project is to develop new hybrid 4-component polyurethane cement coatings with high acid resistance, increased impact resistance and frost resistance. When developing these coatings, we will proceed from the principle: maximum use of domestic raw materials and additives, while reducing import dependence and the cost of manufactured products. An additional economic and environmental effect will be brought using waste from the mining and metallurgical complex (MMC) and energy complexes of Kazakhstan, in particular shungite (East Kazakhstan region) and ash from coal-fired thermal power plants (CHP) in Almaty. From the beginning of 2022 to the present day, prices for building materials in Kazakhstan have increased by more than 30%, thereby causing an increase in the cost of the construction process, repair of buildings and structures. With the investment of large capital and the development of the construction industry in Kazakhstan, there is a huge demand for the development and production of inexpensive, affordable domestic building materials, especially universal floor coverings, which are an ideal solution for the food, chemical, pharmaceutical, aerospace, electronic, mechanical engineering, textile and mining industries – wherever resistance to aggressive conditions is required operation. The basis of polyurethane coatings is aqueous emulsions of polyurethane resins, a mixture of inert mineral fillers, Portland cement, pigments, target additives. The issue of replacing the main components with waste from the MMC, agricultural, chemical and other industries is of high relevance. The use of such materials and waste as recycled rubber tires, asphalt, concrete aggregate, roofing tiles, cement dust, foundry sand, silica smoke, metallurgical slag, plant waste as fillers have their own prospects in the future. However, these materials have their drawbacks in the field of finance, huge CO2 emissions, as well as the discharge of secondary liquid waste, which have a negative impact on the environment. Therefore, as fillers and additives, we offer waste from the MMC of Kazakhstan – shungite rocks from the Bakyrchik deposit (East Kazakhstan region), which are only being developed in the construction sector, but are already used in the production of rubber and plastic products, dry building mixes (DBM), cosmetics and other areas, as well as ash from coal-fired thermal power plants in Almaty, actively used in the production of DBM.
Purpose	Development of new formulations and production of hybrid 4-component polyurethane cement floor coverings using industrial processing products as fillers and pigments.
Objectives	1) working out the modes of enrichment of shungite ore and ash processing of coal-fired thermal power plants in Almaty (CHP-2, CHP-3). 2) reduction of cement consumption in the formulation by optimizing the technology of obtaining 4-component polyurethane cement floor coverings. 3) determination of the main quality indicators of the developed polyurethane cement floor coverings.

	4) obtaining and testing of developed polyurethane cement floor coverings on a semi-industrial scale; 5) determination of the radio shielding properties of the obtained polyurethane cement floor coverings. 6) development of a technological scheme for obtaining 4-component polyurethane cement floor coverings. 7) development of the technological regulations of the Republic of Kazakhstan "Safety requirements for 4-component polyurethane cement floor coverings".
Expected and achieved results	Expected results: • new formulations of 4-component polyurethane cement floor coverings will be developed using shungite materials and ash from coal-fired thermal power plants; • existing formulations of polyurethane cement floor coverings will be optimized; • floor coverings will be obtained from the developed formulations and applied on small areas in the testing laboratory; • the physico-mechanical and physico-chemical properties of the developed polyurethane cement floor coverings will be studied; • pilot-industrial tests will be conducted on the basis of partner companies of the Project; • a technological scheme for the production of 4-component polyurethane cement floor coverings will be developed; • the technological regulations of the Republic of Kazakhstan will be developed. Publications: According to the results of the research, it is planned to publish at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications indexed in the Science Citation Index Expanded and included in the 1st (first) and (or) 2nd (second) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 65 (sixty-five); or at least 1 (one) article or review in a peer-reviewed scientific publication indexed in the Science Citation Index Expanded and included in the 1st (first) quartile by impact factor in the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 80 (eighty).
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List of publications with links to them	
Patents