Spectrum Journal of Innovation, Reforms and Development
Volume 10, Dec., 2022 | ISSN (E): 2751-1731
Website: www.sjird.journalspark.org

ANALYSIS OF THE EFFECTIVENESS OF THE USE OF POROUS AGGREGATES FOR LIGHT CONCRETE

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Abstract
Rational and integrated use of mineral natural resources, more complete utilization of industrial waste, reduction of fuel and energy costs and material consumption for the production of building materials and products are the main directions in the development of the construction complex of the Republic of Uzbekistan.
The development of modern construction is aimed at reducing the mass of objects under construction, due to the production and use of effective building materials, which should include porous aggregates and light concretes based on them.

The use of light concrete allows to reduce the mass of reinforced concrete structures by 30-35%, to enlarge the elements of buildings, improve thermal and acoustic performance, reduce transportation and installation costs and reduce the cost of construction. For example, the replacement of brick exterior walls with lightweight concrete panels on porous aggregates reduces their weight by 6-7 times and reduces the above costs by 15-20%.

The production of light concrete in Central Asia, including Uzbekistan, is based almost exclusively on expanded clay gravel. However, raw materials for the production of expanded clay gravel are very limited and do not fully provide the construction industry with the necessary volume of porous aggregates and, accordingly, light concrete. To solve this problem, it is necessary to develop research aimed at finding more affordable and widespread raw materials and industrial waste for the production of artificial porous aggregates and light concretes based on them, studying their physical and technical properties, structural features, reliability and durability.

An important direction of technical progress in construction is to reduce the mass of constructed objects due to the production and use of effective building materials, which should include porous aggregates and light concretes based on them.

The use of lightweight concrete allows you to reduce the weight of products and structures of buildings by up to 35%, steel consumption by 20%, and cement by 10%. At the same time, the dimensions of structures and spans of buildings and structures increase, thermal and acoustic characteristics improve, and resistance to dynamic and seismic influences increases.

In recent decades, a large number of studies have been conducted on the selection of the composition, the development of technological parameters of production, the theory of strength, physical and technical properties and durability of lightweight concrete on porous aggregates.

To obtain effective lightweight concretes, high-quality porous aggregates are required. It is known that at present the largest share in the total volume of production of artificial porous aggregates is occupied by expanded clay (70-75%). To obtain expanded clay, highly plastic and easily removable clays are needed-bentonite, kaolin, montmorillonite and others.

However, the absence of the above clays in many regions does not allow obtaining the most common expanded clay. Recently, as many researchers have noted, scientific work has been carried out to explore the possibilities of developing porous aggregates using various industrial wastes and local raw materials (ash gravel, aggloporite, quartzporite, camporite, etc.) to expand the range of porous aggregates, reduce the cost of raw materials and energy costs for their production.

Quite a lot of experience has been accumulated in the CIS and abroad in the use of structural lightweight concretes on various porous aggregates. At the same time, the following types of products and structures have become the most widespread: wall panels, slabs, ceilings and coverings, as well as trusses, beams, arches and others. Leading research institutes in the field of construction have summarized the experience of designing and constructing buildings and structures for various purposes using light concrete. At the same time, it was found that replacing heavy concrete with light is economically effective if the cost ratio of large porous and dense aggregates in industrial buildings is 1: 1.5; in large-panel residential buildings 1:2.5; in agricultural buildings 1:3. It is also known that the lightweight concrete structures used are not inferior to heavy concrete structures in terms of their physical and mechanical strength, deformability and durability.

The well-known porous fillers include inorganic: expanded clay, aggloporite, slag pumice, fillers from the ashes of thermal power plants, expanded perlite, vermiculite and also organically: polyurethane foam, polystyrene, etc. Each of these placeholders has its own characteristics [Table.1.], which largely determine the properties of concretes based on them. They can have a different ratio of vitreous and crystalline phases characterized by different strength and deformability, differ from each other in thermophysical parameters.

Table 1.Comparative characteristics of porous fillers

	Water absorption by weight, %	Average density kg/M3	Thermal conductivity W/ m.K	Compressive strength , Mpa
Expanded clay gravel	13-30	300-800	0,3-0,5	0,8-5,5
Swollen perlite	29-30	100-300	0,04-0,06	0,3-0,6
Agloporite crushed stone	16-31	800-1100	0,23-0,6	0,65-1,6
Slag pumice	13-31	800-1100	-	0,6-3,7
Polystyrene foam granules	До 3	10-35	0,03-0,04	0,05-0,15

However, the currently widespread porous fillers have a strength of 3-4 Mpa.

In this regard, research aimed at finding new porous aggregates from local raw materials, such as clays, is promising.

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