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Article 1

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Zeolite containing biocomposition materials for bone-plastic surgery

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Keywords: biocomposition materials, hydroxyapatite, zeolite, technology of production, porosity

Abstract

Technology of biocomposite materials from neutral and highly-alkaline matrix glasses and fillers are: calcium deficient hydroxyapatite and microporous zeolite is obtained. The materials obtained in this work has controlled pore structure and adjustable pore size. The introduction of zeolite into the composition of biocomposite materials, leads to the formation of open pore with small dimensions in the materials and increases the permeability. The parameters of regulation of the pore structure of the this materials are: the introduction of a blowing agent, a change in the ratio of the proportion of glass in the composition, to the proportion of filler, the use of fillers with a large particle size. The materials, approaching the level of properties of trabecular bone tissue are obtained.

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Article 2

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Promising ways of improving binders silicate materials

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Keywords: renewable raw materials, mineral additives, hardening accelerators of cement systems

Abstract

The ways of increasing environmental friendliness and reducing the material intensity of production of building materials through wider use of gas-filled systems, as well as the use of renewable raw materials and various wastes are considered. From mineral supplements promising calcium sulfoaluminate and alunite. The principles of selection of inorganic Portland cement hardening accelerators are presented. The greatest increase in the strength of the stone gives the use of viscosity reducing agents that reduce the water demand of cement systems, but anionic additives (C-3, Melflux) dilute only the cement dough, having little effect on the filler. The principles of search of new additives are offered. For the wide

involvement of gypsum waste in the production of building materials, additives are needed that bind the salts of fluorine, boron and citric acid.

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Article 3

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Obtaining modern wall materials with improved operational properties based on waste of heat and energy

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Keywords: ash and slag waste; sulfur; sulfur concretes; heat insulation materials

Abstract

The use of secondary products of the industry is very important because it provides the production of rich sources of cheap and often already prepared raw materials, as well as reduce the degree of environmental pollution. An important task of the state is to consistently increase the level of use of secondary products of the industry. The main objective of this study is to obtain cement concretes with improved operational properties from petrochemical and thermal power waste. Samples of four different compositions with different water-cement ratio (W/C) and different composition of ash-and-slag ash waste aggregate were studied. The optimization of the compositions and the study of the properties of composite materials were carried out using the following physicochemical methods: determination of strength, density, water resistance and thermal conductivity. A protective waterproof and reinforcing layer is formed on the surface by the method of impregnation in a sulfur melt of concrete. At the same time, the strength, thermal insulation and waterproof properties of the material are improved, which in turn expands the scope of application of the materials obtained, for example, for thermal insulation in external walls.

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Article 4

Larsen O. A., Dmitriev N. S., Naruts V. V., Shvetsova V. A.

Efficient concretes with recycled concrete aggregate

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Keywords: concrete mix, two-stage mixing, period of formation of cement-based materials, recycled aggregate, water demand, interfacial transition zone, fly ash, calcium hydroxide, standard consistency, ultrasonic method

Abstract

Introduction. Concretes with crashed coarse aggregate has lower strength than concretes on natural coarse aggregate, and also their concrete mixes lose mobility in early periods due to the large number of capillary pores in concrete scrap and the presence of interfacial transition zones between the aggregate grain and the cement stone sticking to it. A method for solving these problems using the two-stage mixing technology is considered. Materials and methods: the structural theory of concrete was used to determine the water demand of the secondary aggregate. Samples were made from concrete mixes of normal and two-stage mixing, tested for compressive strength, and the formation of the cement-based materials of mixtures was investigated using ultrasonic analysis. Results: Concrete mixes of two-stage mixing retain of the loss of flowability of concrete mixture. At the age of 28 days, the sample of standard mixing showed a compressive strength of 46.7 MPa, and the sample of two-stage mixing showed 54.1 MPa. Discussion and conclusions: The increase in strength at the age of 28 days is 16%, the retaining of mobility is higher. This proves the positive effect of two-stage mixing on the formation of the cement-based materials and on the strength of concrete.

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Article 5

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Effect of ultra-dispersed additive from preliminary hydrated cement on the properties of cement paste

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Keywords: nano-modification, cement hydration, nucleation, regulation of material properties, additive to concrete

Abstract

The effect of pre-hydrated cement slurries on the properties of hardened cement pastes was studied. Pre-hydration of the cement occurred within 2, 4 and 6 hours and forced mixing of the cement slurry. The change in the dispersion of particles as a result of hydration was studied. It was shown that with the preliminary hydration of cement as a result of hydrolysis, the dispersion of particles increases, which leads to an increase in the nucleuses of new growths of the hydrate phases. The effect of pre-hydrated cement suspensions on the properties of hardening cement pastes is determined. It has been shown that the introduction of a pre-hydrated additive leads to an increase in the water demand of the cement paste by 12, 17 and 14% with a preliminary hydration duration of 2, 4 and 6 hours, respectively, and to a reduction in the setting time due to the formation of additional crystalline hydrates in cement pastes, which speeds up the processes structuring cement pastes. The rate of curing of hardening cement pastes with the addition of 10% pre-hydrated cement slurry increases with increasing duration of pre-hydration of the additive. The results obtained allow us to recommend the addition of pre-hydrated cement in the form of a cement suspension as a cement gel for the nano-modification of concrete.

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Article 6

Bikmukhametov A. R., Rakhimov R. Z., Rakhimov N. R., Potapova L. I. Activated by alkalow cements based on mergel with limestone additive

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Keywords: kaolinite, marl, alkali, mechanical properties, reaction products

Abstract

The expanding raw materials base is one of the drivers for the further development of inorganic binders, including alkali-activated cements. This research focuses on studying marl as precursor, and limestone as a mineral addition to alkali-activated cement. The optimal calcination temperature providing reactivity of marl is determined. The mechanical properties, microstructure, and reaction products of hardened pastes are investigated.

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