SPbPU has patented an expanding additive for cement based on high-calcium fly ash

Scientists from the Engineering and Construction Institute of SPbPU — Yuri Barabanshchikov, Doctor of Engineering, Ksenia Usanova, Candidate of Engineering, and Vasily Krotov, a graduate of the CEI master's program — have invented an additive composition for producing expanding and non-shrinking cements and creating concrete and cement mortars based on them.

Shrinkage, which usually occurs during the hardening of cement mortars and concrete, often leads to cracking. The most effective way to combat shrinkage in building materials is to compensate for it with expanding additives. The invention of SPbPU scientists consists in the creation of an expanding additive that allows regulating the shrinkage of concrete and cement mortars and obtaining both non-shrinking and expanding concrete and cement mortars.

The additive developed by the scientists contains high-calcium fly ash from the Nazarovskaya GRES power plant and a water-soluble reagent, which is calcium nitrate in an amount of 5 to 15% by mass of the fly ash. Experimental tests to study fly ash and concretes based on it were carried out in accordance with proven methods using certified equipment and digital software complexes.

The tests showed that the presence of calcium nitrate causes significant expansion of fly ash and, accordingly, reduces concrete shrinkage. With a calcium nitrate content of 10% or more, fine-grained concrete expands within 3 days. After that, shrinkage deformation occurs, passing into the negative range. After 8–15 days, fine-grained concrete gains sufficient strength, and subsequent shrinkage is not dangerous in terms of cracking.

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