COMPUTER SIMULATION OF RESIDUAL STRESSES IN MODERN CONCRETE MIXES *

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The active use in the construction of modern concrete mixtures requires a detailed study of concrete, as a complex material whose properties are directly related to its structure. One of the important features of the stress state of concrete during hardening is the occurrence of local residual stresses in them, which determine the deformation and strength characteristics of the material [1, 2, 3].

To study residual thermal stresses in multicomponent concrete mixtures, an approach to computer modeling of materials was developed taking into account the hierarchy of rheological processes in powder bodies and the modification of hierarchically organized structures [4]. The approach of physical mesomechanics is used in presented investigation. It combining the ideology and tools of solid state physics and micromechanics of media with structure [5]. A series of computational experiments was conducted to determine the residual thermal stresses in the matrix of concrete model samples.

As a result of computational experiments, it was shown that during hardening of a mixed compact of concrete due to anisotropy of the elastic moduli and linear expansion coefficients of its components, the residual stresses at the micro level can reach a significant value. This can lead to hardening or softening of the material of the finished structure in certain conditions. The control of the values and behavior of the residual stresses is possible by optimizing the concentration composition of the components of the initial concrete mixture.

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* The work was supported by the Russian Foundation for Basic Research under grant No. 19-48-390001.