Consideration of a heterogeneous medium taking into account the microstructure

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Issues related to taking into account the microstructure (geometry and physical characteristics of phases) of a heterogeneous medium, its influence on the behavior of the entire system and its changes present significant difficulties. Based on the use of continual approaches to describe heterogeneous media [1], a mathematical model was built that takes into account the elastic properties of a heterogeneous system and displays the microstructure of a heterogeneous system and its change under the influence of loads. The microstructure is taken into account by introducing a non-local operator in methods based on the Green's function, which with the subsequent convolution of the Green's function with the correlation function of the structure geometry allows one to take into account the microstructure of the system in a more general form. The study is carried out for a heterogeneous material [2] obtained by the method of cold gas-dynamic spraying with subsequent laser treatment. In this regard, the presented in the model information on the evolution of the microstructure takes into account the dissolution process and the occurrence of a chemical reaction (the model takes into account the mechanism of a decrease in the size of boron carbide B4C particles). The model contains information about a significant change in the properties of the structure. The reported study was funded by RFBR according to the research project No. 20-31-70001.

[1] Khoroshun L P 2000 *Applied Mechanics* **30** 30–62
[2] Mishin A V and Fomin V M 2020 *Applied Mechanics and Technical Physics (accepted for publication)* **5**