In the near future nanostructured materials will be used in spacecraft and space engineering. Existing experimental and theoretical data demonstrate that such materials response to various space environment effects can differ substantially from that of conventional bulk spacecraft materials. Therefore, it is necessary to determine the space environment components, critical for nanostructured materials, and to develop novel methods of mathematical and experimental simulation of the space environment impact on such materials.

Modeling is a very important scientific tool for explaining various phenomena and predicting the behaviour of existing and designing materials under different conditions. Changes in the materials properties, caused by the environment impact, are determined by parameters and processes that are related to different spatial scales: from the size of atoms and molecules to the size of macroobjects. There is a variety of computer simulation methods but most of them can be applied only for a special spatial and time range/scale because of underlying approximations. To estimate the durability of nanostructured materials to the space environment impact it is necessary to investigate both fundamental effects of incident particle interaction with nanosized structures within very short time intervals and resulting effects of material damage and changes in their properties, that can be observed at micro- and macroscale within much longer periods. Thus, in general case to study the whole set of elementary processes and resulting effects it is necessary to apply the multiscale simulation approach [1].

This paper considers the application of state-of-arts computer modeling methods to simulate physical and chemical processes that may occur in nanostructured materials under the influence of different space components. In accordance with the multiscale simulation approach, these methods are categorized into four main groups related to different spatial and time scales: quantum, atomistic, meso- and macroscale. For each group, a brief description of existing methods as well as their limitations and underlying approximations are given. For the main space environment components, an ordered sequence of applying methods is proposed (for instance, see Fig. 1); this sequence takes into account the most important processes caused by the component under consideration.

**REFERENCES**