PROSPECTIVE DIRECTIONS IN ROCKET-SPACE MATERIALS SCIENCE

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The authors of this paper analyze not only new developments, but also the tendencies for development of space materials science in XXI century on the basis of inspection of home and foreign literature and their own experience in materials science.

In spite of in-depth study and widespread use of carbon materials in the rocket-space engineering, this direction will be further developed in XXI century. Besides heat-shielding coatings for descended apparatuses and solid-propellant engines, carbon materials are of interest for electronics. Even in 1919 A.F. Ioffe pointed out semi-conductive and super-conductive properties of carbon materials. We believe that these predictions will be reality owing to the fullerene structures which will be discussed widely at this conference. If polymer composite materials are created on the basis of fullerenes, their strength will exceed the strength of steel more than 20 times.

Today oxides-based fullerene structures have been created and we should expect carbide-based and other fullerenoids. The high-temperature super-conductive materials can be used for shielding against ionizing and laser radiation. Solid foams are of special interest. Ideally, they can be produced in space. Materials created at the space stations and on the Moon will gain wide application, because here ultrahigh vacuum, radiation, zero-gravity state or low gravity will be around. This will provide absolutely new structures. Powder technologies for creation of different materials, from high-strength to "intellectual", will be further developed. Today polymer composite materials are being developed for load-bearing units in rockets and space apparatuses, and as semiconductors and magnetically soft materials.

Time will come when a large television screen can be polled up after demonstration. Perfect vacuum, nano- and microtechnologies will be developed both in the Earth and in space. Prospective light constructions for rockets and space apparatuses will be created on the base of new materials. New principles of rocket moving will be possible and new materials will be required for this purpose. All new creating materials must be reproduced in the constructions based on the technologies that maximally save resources and power. In this brief report we cannot reflect comprehensive ideas of all the new directions in rocket-space materials science and in materials science in the whole.