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Intellectual Technologies in Industry and Aerospace Complex

Features of the use of intelligent technologies in industry and in the aviation complex based on the use of intelligent polymer composite materials are considered.

Intellectual technologies in industry and in the aerospace complex suggest the wide use of polymer materials (PM) and polymer composite materials (PCM). Traditional PM, including PCM - is primarily multifunctional materials. This is expressed in the fact that their properties depend (as a rule, nonlinearly) on the properties of the components (ingredients) that make up their composition [1-8].

On the basis of traditional polymers, various types of PM - constructional materials have been developed and successfully used to work in the field of elastic (with a certain share of elastic) deformations (plastics, unfilled and filled - reinforced plastics, PCM with continuous fibers and deterministic anisotropy of properties - fibrous PCM - FPCM) materials for using in the field of elastic deformations (rubbers based on high-molecular and low-molecular "liquid" rubbers, elastoplastics and thermoplastic elastomers), lacquer and enamel, coating elasts, adhesives, sealants, compounds, foamed porous foams and the like.

A variety of types of polymers used in the production of traditional PM, bonding (matrix) PCM, fillers consisting of substances of different nature (mineral, carbon, organic), dispersed - in the form of fibers, and textiles (yarns, strands, bands, fabrics) as well as non-woven (felt, mat, paper) forms of them allows you to model a wide range of materials with the necessary set of operational properties (structural, dielectric, conductive, tribotechnical, vibro damping, vibration absorbing, heat-shielding, x ically and radiation-resistant, heat, heat, flame-retardant, and other).

Among the above mentioned types of PM and PCM functional (or special) purpose, among which first of all, intelligent, radio screening and radio absorbing materials, polymeric materials for protection from high-speed indenter influence (armor materials, products and structures), thermal protection materials, and also polymeric honeycomb materials, can significantly expand the use of PM and PCM in products of modern technology that meet the specific conditions of their operation in a complex stress-strain state (SSS) and gradient temperature effects.

A relatively new class of PM, namely intellectual materials (IM or Smart Materials) was created in order not only to actively counteract the above external factors, but also to adapt to them optimally by "estimating" the system of indicators characterizing both the external impact, and its own state.

In the optimum, intelligent PCMs, primarily PCMs with continuous fibrous fillers (FPCM), show the ability to "analyze" and "manage" a set of their performance characteristics according to an algorithm predetermined by the developer.

Often the concept of ID is associated with nanotechnology, where these IDs are used.

As the most promising sectors and directions of scientific research in the field of nanotechnology, there are:

- military-industrial complex (responsible parts of mobile equipment);
- electronics and IT (radar systems, sighting systems, lasers, data transmission, processing and storage systems);
- energy (improving the efficiency of existing equipment, fuel cells, alternative energy);
- medicine and biotechnology (nano formulations, drug delivery);
- manufacturing industry (increasing the resource and accuracy of machines and equipment, reducing operating costs, new performance characteristics and materials, etc.).

The prototypes of innovative IPCM and technology, which is used to manufacture spars of helicopters, which should use under conditions of varying power loads, high humidity and with significant temperature differences are developed.

Other priority areas of research in this area are: a wide range of composites (based on polymers, ceramics, adhesives) with new properties; nanostructures based on graphene; self-renewing materials and coatings; regulatory structures and self-organizing systems; sensory and active elements with improved performance characteristics, etc.

According to [6], the advantages of using intelligent aircraft structural materials, in comparison with traditionally used materials, are as follows:

- improvement of flight performance of the aircraft, which is achieved by adapting aerodynamics and wing surfaces to the current flight conditions on the principle of feedback;
- increase in the service life of the responsible functional components - due to the preservation of their structure and properties under harsh operating conditions;
- increase in the life of the outer skin of structural elements - due to the use of self-regenerating coatings during their formation;
- increasing the comfort of the crew and passengers in flight conditions - by reducing vibration and aircraft noise.

Conclusions

Based on the review of the world market of nano-modified (NM) IPCM, the following indicators characterizing its development at the present time can be distinguished:

- 1 The common problem for the whole market of NM IPCM is the high cost of production and low production volumes.
- 2 The most developed market of NM IPCM is in regions characterized by positive dynamics of the entire nanotechnology sector in the US, Europe, and China.
- 3 Demand for NM IPCM is mainly formed by the military sphere and medicine.
- 4 The world market has a great interest in creating technologies and formulations for new NM IPCM and expanding the scope of their application.

5 Ukrainian market NM IPCM shows a significant gap with world leaders in this area.

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