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# ОСВІТА, НАУКА ТА ВИРОБНИЦТВО: РОЗВИТОК ТА ПЕРСПЕКТИВИ

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## PROSPECTS OF DEVELOPMENT OF NANOTECHNOLOGIES

**I.V. Demchenko, A.V. Bulashenko**

National technical university of Ukraine "Igor Sikorsky Kyiv polytechnic institute"  
icegloom@gmail.com, an\_bulashenko@i.ua

Nanotechnologies have prospects for development as the result of studying this field of science can be used in many fields of human activity [2-4]. Science itself nanotechnology is poorly understood, which is the basis of its relevance for today.

Various devices and materials created with the help of nanotechnology are becoming a logical step towards improving technical systems and scientists predict the triumph of nanotechnology in the very near future, as they penetrate most of the branches of production [1].

Nanotechnology in medicine:

1) Magnetic nanoparticles.

Magnetic nanoparticles in medicine are used for targeted drug delivery.

This method reduces the toxic effects of drugs on other organs and body systems, and with the help of such nanoparticles it is possible to direct and retain in the proper place of the body nanoparticles with a drug, and also visualize them using the method of magnetic resonance imaging.

2) Nanobots

In early 2015, in the field of robotics, the first successful tests with the use of nanobots were performed, which fulfilled the task set before them inside the living organism. Their task was to deliver microscopic particles of gold to the stomach of laboratory mice. By the end of the experiment, scientists had not detected any damage to the internal organs of mice, and also noted that the delivery of nanobots of gold particles proved to be more effective than the introduction of these particles with food intake.

Thus, the use of nanotechnology in medicine can lead to a big jump in the ways people are treated: methods of treating diseases that are now considered incurable can be developed, it will be possible to rejuvenate the human body by creating new tissues. There will be an opportunity to diagnose the condition of the body and identify diseases that do not show their symptoms.

Advances in nanotechnology are used in construction to create a variety of materials with complex structure and unique characteristics, as well as creating materials capable of self-organization at the atomic-molecular level, which allows creating certain objects without external interference. Prospective nanoelements for the construction industry are fullerenes and nanotubes.

Fullerenes can be used for:

1) the creation of new construction materials with unique properties for use in the construction of engineering and technical facilities and in the manufacture of personal protective equipment.

2) production of new composite materials for electrical purposes.

3) improving the performance of vehicles and other special mechanisms.

4) production of new composite materials for optical and electronic countermeasures.

Nanotubes can be used as heavy-duty filaments, nanoscrews. Also including nanotubes in various alloys (aluminum, magnesium, lithium) can significantly increase wear resistance and strength.

Thus, the use of nanotechnology in construction leads to the fact that it will be possible to control and manage the process of structure formation, starting from the nanoscale level, as a result of this will be the receipt of materials differing in structure and properties.

The specialists of many countries in the space field pay attention to the analysis and forecasting of the possibilities of using nanotechnologies in space systems and suggest that they can be used to create space elevators, reusable spaceships, autonomous devices for studying planets, intelligent coatings, multifunctional nanomaterials, etc.

It is also assumed that with the help of nanotechnology, it will be possible to study and monitor the solar system and the development of the Moon, Mars and Venus.

The use of the achievements of nanotechnologies in the cosmic sphere can be started very extensively with the study of our solar system, with the subsequent increase in the range of research up to the far space, and finish with research on planets that can not now be investigated for a number of reasons using nanorobots.

Prospects for the use of nanotechnology in the military sphere can be used for different purposes. One of these purposes can be a bulletproof vest with a small thickness, but with equal or enhanced security due to the fact that due to nanotechnology, the material characteristics can be changed. Also promising will be the development of controlled nanorobots, which due to their size will be able to conduct reconnaissance operations or penetrate the human body destroying it. It is worth noting the fact that scientists from the University of Dallas in Texas were able to create a cloak that can imitate a mirage, so they were able to achieve negative light refraction.

Thus, the use of nanotechnology in the military sphere is very promising. this increases the defense capability of a country that uses nanotechnology, as well as to improve weapons and develop new methods of warfare.

Nanotechnologies are already used in the textile industry for various purposes: lining clothing, creating a sensory coating, attaching clothing to repelling insects, etc. Adhesive plaster created with the help of nanotechnology has antibacterial properties, and therefore no additional action is necessary to disinfect the wound. The disadvantage of nanotechnology for today is their high cost, but this is normal for the developing branch of science.

Nanotechnologies are an advanced and promising direction for the development of science and technology for the near future. The use of nanotechnology will not be limited to peaceful purposes alone, the achievements of this industry can also be used in the military sphere. Also, nanotechnologies in themselves have the potential for commercial activity, and not only the state, but also private companies invest in this sphere.

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