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INTERCONNECTION OF NANOTECHNOLOGIES WITH INFORMATION CARRIERS

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In our time, information is the most valuable thing we have. It is the best guarantor of peace and the strongest weapon. The preservation of information becomes an issue of high priority. Some people consider it as a panacea for all illnesses, others threaten with calamity if they use it carelessly. The development of information carriers is gaining new opportunities, scientists are using all their knowledge in the field of nanotechnology.

The purpose of the study is to define the concept "nanotechnology" and trace the impact of nanotechnology development on the development of information carriers.

The ***subject*** of the study is different types of information carriers which exist nowadays.

According to the purpose the following **tasks** have been identified: to study current resources about the subject of the paper in order to give the definition of the concept "nanotechnology", to trace the connection between the development of nanotechnologies and information carriers.

The methods of observation, classification, generalization, description are used in this paper.

The relevance of the topic. All scientists understand the importance of information in our life and on the global scale of the world society. The newest types of media can become extremely useful for organizations that deal with analysis of large amounts of data. For example, it could be museums, libraries, industrial enterprises and states. Without the development of information carriers it is impossible to develop the infrastructure of the world as a whole.

Nanotechnology is the technology of ultra-microscopic structures made from tiny particles of matter.

The word "nano" (from the Greek nanos) is a prefix, meaning one billionth of something (in this case we are talking about the size, so let's talk about a nanometer - one billionth of a meter).

The atom (Greek atomos - indivisible) is the smallest particle of a chemical element. However, despite the meaning of its name, the atom is not indivisible, since it consists of a nucleus and electrons. For convenience, scientists believe that the atom has the shape of a sphere. Joining together, several atoms create a molecule. A molecule can be represented as a collection of balls (atoms) and connecting sticks (interatomic bonds). All substances in nature, including people and other objects, consist of atoms and molecules.

All atoms, as well as some small molecules, have dimensions of the order of 1 nm (nanometer). Nanotechnology is a set of methods for producing products of a given atomic-molecular structure by manipulating atoms and molecules, particularly directed movement and positioning of atoms in space.

The first scientist who used measurements in nanometres, is considered to be Albert Einstein, who in 1905 theoretically proved that the size of the sugar molecule is equal to 1 nm.

Interconnection with media.

The rapid development of nanotechnology is caused by the needs of society in the rapid processing of huge amounts of information. Nanotechnology has made it possible to store information in DNA, molecular, holographic, magneto resistive and other carriers.

A huge number of scientists have successfully worked on research and the creation of the tiniest carrier of information. The most outstanding scientists in the sphere of nanotechnology

development are Erlich and Zielinski, researchers from the University of Southampton and Peter Kazansky.

Memory of the DNA

DNA contains information about a living organism. It codes every particle in a living being. That's why it makes sense for corporations like Microsoft to invest in research that studies how DNA can be used to store data. Unlike most of the existing data storage devices out there, DNA doesn't degrade over time, plus it's very compact. For example, just four grams of DNA can contain a year's worth of information produced by all of humanity combined. However, to ensure the safety of information, you just need to put it in a place where it's cold, dry and dark.

Erlich and Zielinski stored six files into 72,000 DNA strands, each 200 bases long. The files included a full computer operating system, a 1895 French film, an Amazon gift card, a computer virus, a Pioneer plaque, and a study by information theorist Claude Shannon. "We mapped the bits of the files to DNA nucleotides. Then, we synthesized these nucleotides and stored the molecules in a test-tube," Erlich told ResearchGate. But it has not been possible to find a way to read information from DNA without destroying the carrier yet. If the data on the hard disk is stored in the form of zeros and ones, then for writing to the DNA chain they used four alphabetic characters: A, T, G and C (adenine, thymine, guanine and cytosine).

DNA is one of the most robust storage systems available, and the technology could be available for consumers in a little more than ten years.

Quartz carrier. Scientists from the University of Southampton have developed a new type of information carrier. The material is a nanostructured quartz glass, for which a recording process and a data reading mechanism have been developed. A femtosecond laser is used that records information in 5D mode. Reading of information is carried out using a device that combines the functions of an optical microscope and a polarization filter.

One small disk stores about 360 terabytes of data. This capacity is equivalent to the capacity of half a million ordinary CDs. The material remains stable at temperatures up to 1000 ° C, and at room temperature it can exist almost forever. At a temperature of 190 ° C, the lifetime of the material is estimated in billions of years (13 billion). At the same time, all the information stored remains intact, as long as the disk itself remains intact.

The burnt nanostructures change the polarization of the light passing through the glass. Thus, the information can be read using an optical microscope and a polarizer.

The technology was first demonstrated in 2013, when a 300 KB document was saved on the disk, and then it was successfully viewed. Now the Universal Declaration of Human Rights, Newton's Optics, the Magna Carta, the Bible has also been recorded. The books written in this way can exist for very long time on Earth. The technology is being refined and improved.

"It's amazing to even think that we have created a technology that allows us to save documents and other information for future generations. This technology can save everything that we have learned, "says Professor Peter Kazansky.

If we record all the information known to people on such crystals, it will never disappear, becoming a reliable proof of the existence of our civilization.

To conclude it is important to say that development of information carriers directly depends on the development of nanotechnology because the technology of creating the newest media is based on the discoveries of nano. Being able to store more data in a smaller volume, nanotechnology creates ultra-thin coatings of microscopically small particles. The carriers can be called nanosilicate, since the methods of encryption and storage of information refer to nanotechnologies.

All prototypes of the latest developments in this field have shown excellent results and it makes sense to continue research and seek new ways of reading and optimizing information.