

Exhibition «Mitki and Nanotechnology»

The successful development of the state-of-the-art nanotechnology is closely linked to its ability to offer high-tech goods to consumers. In turn, building up nanotech market in our country is hardly possible without understanding that the nanotechnology industry is crucial for the innovation development. To this end, popularization of the basic ideas behind nanotechnology becomes more and more important.

Speaking of nanotechnology in general, it turns to be relatively difficult to formulate the ultimate goals of the development of such technology in terms that would be understandable to a wide audience. The situation here differs considerably from, say, space exploration, when launching the first artificial satellite or the first manned space flight were quite tangible and clear objectives. It is therefore not surprising that nowadays even a well educated person is often puzzled with rather elementary questions like:

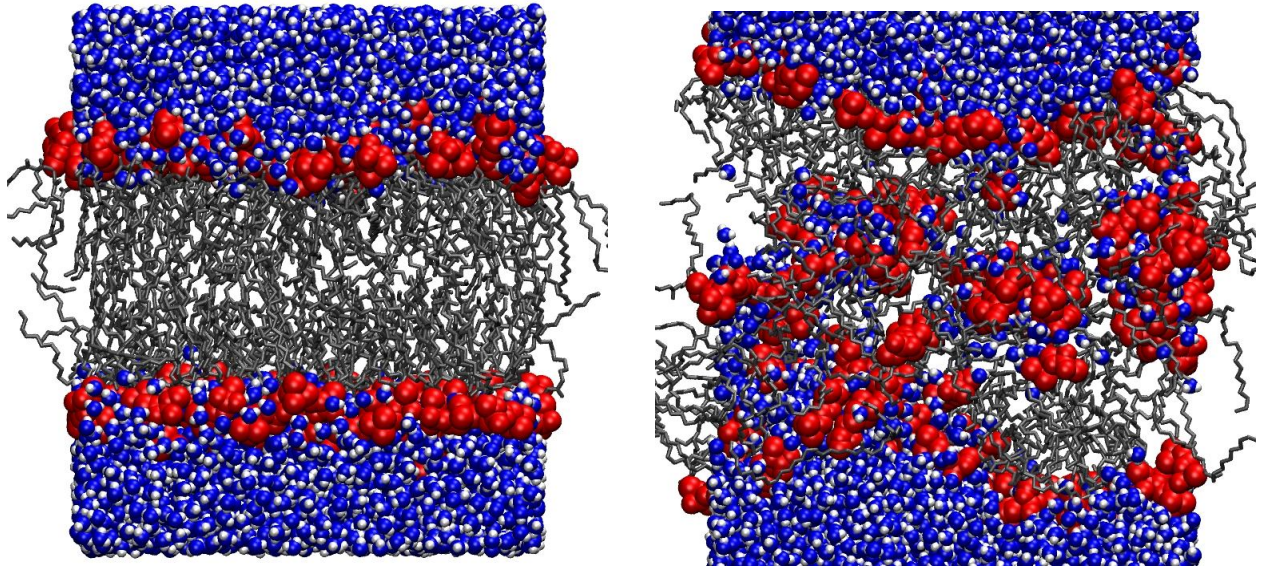
- What exactly is the nanotechnology?
- What is it for?
- Why is its development so important?

Insufficient awareness of the essence of the nanotechnology industry promotes the situation when the term "nanotechnology" is almost exclusively associated with advertisements of so-called "nano-socks" and "nano-creams" so that it is very easily to get an impression that "nanotechnology" is something that is inside a jar with wax shoe polish. In reality, scientific research which focuses on studying nano-objects is of tremendous importance in numerous areas such as the creation of new materials, the development of more effective therapeutic drugs delivery systems, the use of nanotechnology in biomedical applications, etc.

The purpose of the Exhibition «Mitki and Nanotechnology» is to popularize the state-of-the-art scientific research in the field of nanoscience. The exhibition presents a series of paired art works, the first of which is a visualization of a particular scientific phenomenon, and the second is an artistic (metaphorical) interpretation of the same phenomenon. The scientific presentations were based on the studies performed by the researchers of the Institute of Macromolecular Compounds, Russian Academy of Science, St.Petersburg. The artistic illustrations were made by the artists of the art-group "Mitki" and their friends: Dmitry Shagin, Tatiana Shagina, Andrey Filippov, Vasilii Golubev, Irina Vasilyeva, Alexander Gorjaev, Andrey Kuznetsov, Svetlana Badelina, Kirill Miller and Nikolay Kopeikin. Each painting has a format of 50x65 cm.

Below is shown an example of such paired art works.

The first figure shows ethanol-induced changes in the structure of the cell membrane: With the use of the state-of-the-art methods of computer modeling it was demonstrated that ethanol leads to irreversible structural changes of cell membranes when ethanol concentration exceeds 30 v. %. In more general terms, this study explores the possibility to control the permeability of cell membranes by means of small amphiphilic molecules. Note that the thickness of the plasma membrane of living cells is about 4-5 nanometers so that studying structural changes in biomembranes belongs to one of the field of nanoscience.



Effect of ethanol on the structure of cell membrane: Computer modeling.

Water molecules are shown in blue, hydrophilic head groups of lipid molecules in red and hydrophobic lipid tails in grey. Shown are an ethanol-free lipid membrane (left-hand side) and a lipid membrane with 30 v. % of ethanol (right-hand side). At such a high concentration ethanol partly destroys the bilayer structure of a membrane, so that water and some of the lipid molecules aggregate in the interior of the membrane with a formation of micelle-like structures. As a result, the cell membrane becomes damaged and is not able to serve as a selective barrier anymore. The simulation snapshots are based on the data published in: A.A. Gurtovenko, J. Anwar, *J. Phys. Chem. B* 2009, 113, 1983-1992. Courtesy of Andrey Gurtovenko (www.biosimu.org).

The influence of alcohol (ethanol) on a living organism attracted attention of a renowned artist Dmitry Shagin, a "modern symbol of St. Petersburg" and also the chairman of the board of trustees of the rehabilitation center for alcohol-addicted people "The House of Hope on a Hill". After having numerous discussions with scientists, Dmitry Shagin finally came up with the idea to illustrate ethanol-induced destruction of cell membranes by depicting two submarines. On the first submarine sober sailors are standing in a row, shoulder to shoulder, similar to lipid molecules in a healthy (ethanol-free) membrane. The second submarine is shown sank, the entire crew is drunk, the sailors are lying inside the submarine, illustrating a destruction of the bilayer structure of a membrane by ethanol.



Venue: A humorous manner of presenting nano-scale scientific phenomena was meant to strengthen the effect of the exhibition, to widen the audience as much as possible and to make the scientific ideas easily understandable even for high-school children. Therefore St.Petersburg Physics and Mathematics Lyceum 239 was chosen as a first venue of the exhibition. The opening ceremony is scheduled for November 15, 2010 and includes (among other activities) a short lecture given by researchers of the Institute of Macromolecular Compounds RAS which is coupled to the commentaries of the artists on their metaphorical interpretation of nano-world phenomena.

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