

NANOSENSORS IN MODERN MEDICINE

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One of the first working examples of a synthetic nanosensor was built in 1999. It involved attaching a single particle onto the end of a carbon nanotube and measuring the vibrational frequency of the nanotube both with and without the particle. The discrepancy between the two frequencies allowed the researchers to measure the mass of the attached particle.

With components the size of molecules, nanosensors are intrinsically smaller, more sensitive, less power-consuming and potentially less expensive than other sensors. They can detect single cells or even atoms, making them far more sensitive than counterparts with larger components.

We can consider 10 different industry sectors in which nanosensors are likely to be deployed, seven different kinds of sensors, for targets such as gases or biomolecules, and eight different types of technology platforms, such as nanoparticles and nanocoatings.

In the military and homeland security area, there is a need for highly sensitive and widely distributed sensors to detect biotoxins and radiation. In the healthcare field, ultra-sensitive labs-on-a-chip could detect and analyze the tiny changes that signify the onset of cancer. The aerospace industry wants to use nanosensors in the bodies of aircraft to constantly monitor where and when a plane needs maintenance. The automotive industry could use nanosensors in vehicles to improve fuel usage and in luxury vehicles to provide improved climate control and seat ergonomics.

There are currently several hypothesized ways to produce nanosensors. Top-down lithography is the manner in which most integrated circuits are now made. It involves starting out with a larger block of some material and carving out the desired form. These carved out devices, notably put to use in specific microelectromechanical systems used as microsensors, generally only reach the micro size, but the most recent of these have begun to incorporate nanosized components.

Another way to produce nanosensors is through the bottom-up method, which involves assembling the sensors out of even more minuscule components, most likely individual atoms or molecules. This would involve moving atoms of a particular substance one by one into particular positions which, though it has been achieved in laboratory tests using tools such as atomic force microscopes, is still a significant difficulty, especially to do en masse, both for logistic reasons as well as economic ones. Most likely, this process would be used mainly for building starter molecules for self-assembling sensors.

The third way, which promises far faster results, involves self-assembly, or "growing" particular nanostructures to be used as sensors. This most often entails one of two types of assembly. The first involves using a piece of some previously created or naturally formed nanostructure and immersing it in free atoms of its own kind. After a given period, the structure, having an irregular surface that would make it prone to attracting more molecules as a continuation of its current pattern, would capture some of the free atoms and continue to form more of itself to make larger components of nanosensors.

The classic example that comes up are nanosensors that can detect early signs of cancer. It's one of those diseases that detecting the small molecular changes at the start could literally be a matter of life and death.

Over time, as they grow cheaper, nanosensors should find their way to bring fundamental changes to the study and understanding of biological processes in health and disease, as well as enable novel diagnostics and interventions for treating disease. So we can see that advances based on nanotechnology and nanoscience could result in a new era in healthcare.

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E-COMMERCE IN UKRAINE

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In Ukraine investment in the Internet and e-commerce has increased dramatically in 2008 year. However, a range of obstacles blocks the growth of e-commerce. With regard to the technical hurdles, few people in Ukraine have access to the Internet and even fewer of Ukraine's 49 million citizens have credit cards for making necessary payments online.

The use of electronic documents is allowed only within the banking system. Through its regulations governing interbank payments, the National Bank of Ukraine allows commercial banks to use electronic documents to make necessary payments online.

Commercial banks which are members of the interbank payment system must use electronic signatures to make online payments, both within the banking system and to their clients. To become part of the online bank payment system and to enable the processing of relevant documentation, a client must enter into a specific agreement with its bank. In this case the use of digital signatures and electronic documents will be based upon a contractual relationship existing between the bank and its client.

There is thus a need in Ukraine for new e-commerce legislation which would govern electronic transactions on a larger scale. A number of e-commerce related draft bills are currently being prepared.