Nanotechnology: Modern Advanced Science and Technology

Nowadays,Nano-science technology is based on many modern advanced science and technology, which involves a wide range of scientific fields. For example, it is a combination of dynamic science (dynamic mechanics) and modern science (chaos physics, intelligent quantum, quantum mechanics, mesoscopic physics, molecular biology) and modern technology (computer technology, microelectronics and scanning tunneling microscopy, nuclear analysis). However, nano-science and technology also give rise to a series of new science and technology, such as nano physics, nano biology, nano chemistry, nano electronics, nano processing technology and nano metrology, etc.Today I would like to talk about the nanotechnology base on these topics.

Nanometer materials

Basically, Nano-material refer to the materials in which at least one dimension of the three-dimensional space is in the nanoscale range (1nm~100nm) or composed by them as basic units. It refers to the change in properties caused by the sharp increase in the ratio of atomic number to total atomic number on the surface of nano-crystals with the decrease in particle size. For example, when the particle is 10 nanometers in diameter, the particle contains 4000 atoms, and the surface atoms account for 40%. When the particle is 1 nanometer in diameter, the particle contains 30 atoms, with 99 percent of the surface atoms.

Nowadays, there are plenty of nanometer-materials. Normally, the nanometer-materials have some characters in common.

1) Surface and interface effect

2) Small size effect

3) Quantum size effect

4) Macro quantum tunneling effect

There is also a new rising nanometer materials getting more and more popular in our daily life and that is the graphene. To be specific, the graphene was found by two scientist of University of Manchester, named Andre Geim and Konstantin Novoselov. And They could get thinner and thinner sheets of graphite in a simple way. They stripped the sheets of graphite from highly oriented pyrolytic graphite and then taped both sides of the sheets onto a special tape. Tearing the tape, they split the sheets in two. And they kept[image: u=397105995,3410460999&fm=26&gp=0.jpg] doing this until getting thinner and thinner, and finally, they had a thin sheet made of just one layer of carbon atoms, which is graphene. They won the 2010 Nobel Prize in Physics. Nowadays there were some common methods for the production of graphene powder are mechanical stripping method, REDOX method, SiC epitaxial growth method, and chemical vapor deposition (CVD) method.

About the graphene, many scientist had made a lot of fantasies about that. According to the character of graphene, it has a huge potential for human. For instance, it can be used to make body armor, battery, it may also be possible to make better chips instead of silicon, and so on. However, the nanometer materials can also be a double-edged. The graphene can be a really good example to prove that. Although the graphene can be really useful to human, it can also bring some trouble. Once the graphene is taken into human's body it can be fatal to humans. According to some latest articles, it has some potentially toxic to human cells. Therefore, we do need to be careful and cautious about graphene. Just like the plastic, we need to considerate both sides. Once plastic was also a new and convenient material, but after that it became the biggest problems of environment. Therefore, we must be careful with the nano-material, in order to avoid making some more problems.

Nanotechnology medicine

Nowadays, as the development of nanotechnology people started to make some achievement on the medical treatment. Normally, the nanotechnology is about using application of the principles and methods of nano-science and technology to medicine. Its category mainly includes two aspects:

Applying nanoscience and technology to develop more sensitive and rapid medical diagnosis technology and more effective treatment methods;

Use nanotechnology to understand the processes and mechanisms of life activities at a more microscopic level.

What is more, there are also some nanotechnology materials can kill bacterias. The basic theory about that is use tiny spikes and nano-crystals produced on the surface of the material using the etching process. These tiny spikes can pierce the bacterial membrane and to kill the bacterial. There are also some advantages about that, it seems that it has no harm to the sells, so maybe it is safe for human.

Nanotechnology structure

About the nanotechnology, once I had done some researches about that. I was very curious about the structure which can waterproof. I found that it actually do happened in the nature. In nature, the surface of lotus leaf is waterproof, which is caused by its surface structure. The small particles on the lotus leaf surface can effectively reduce the surface energy of the water, resulting in a waterproof effect. Therefore, it has a lot of application in our daily life. After that, I started thinking about whether I could build a nano-structured material that could be completely waterproof. And then I looked in the literature, and I found a paper from Tsinghua University on this, and they also simulated this nanoscale structure.

After reading this thesis, I knew a lot of new concept and some new opinions, I hope one day I can also make some big progress on that. It is obviously the nanotechnology is a new and mystery area for human, it is indubitable that it can bring plenty of benefits and convenient for human, but there still a long way for us to exploring and the adventure of nanotechnology is full of dangerous, we need to be careful, because everything have two sides.