

## **Engineering Seminar # 1: Nanotechnology**

Speakers: Dr. Vesselin Shanov, Associate Professor, Department of Chemical and Materials and Dr. Mark Schulz, Associate Professor, Department of Mechanical Engineering from College of Engineering and Applied Science at the University of Cincinnati

Date: June 24, 2009

Time: 1:00 to 3:00 p.m. (2hours)

Prepared by:

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This seminar was jointly coordinated by Dr. Vesselin Shanov and Dr. Mark Schulz from College of Engineering and Applied Science at the University of Cincinnati on June 24, 2009 in 641 Baldwin Hall from 1:00 to 3:00 p.m.

Dr. Vesselin Shanov is an Associate Professor in the Department of Chemical and Materials. He teaches graduate and undergraduate courses in Nanotechnology, Materials Science and Renewable Energy Technology. His research interests include: synthesis, processing, characterization, and application of nanostructured materials with emphasis on carbon nanotubes, and also energy related topics. His nano-science and engineering studies have attracted attention from the scientific community (see <http://www.uc.edu/news/NR.asp?id=4811>).

Dr. Schulz is an Associate Professor in the Department of Mechanical Engineering. He also teaches several nanocourses at undergraduate and graduate level. Both Drs. Shanov and Schulz co-direct the Nanoworld Lab at University of Cincinnati.

Dr. Shanov began the seminar by showing to the teachers a movie about the space elevator which is being touted as a revolution in space transport. This was particularly appropriate because it incorporated nanotechnology in the form of carbon nanotubes, which were included in the Renewable Energy Systems RET research project for solar energy generation. Dr. Shanov explained that a material would need to be as lightweight as carbon nanotubes to be viable in such a structure as well as strong to support the loads that would need to be carried up. He also stressed that the cost of sending supplies per pound right now is around \$50,000-100,000 but with this elevator it would be closer to \$100,000.

Next, Dr. Shanov gave a presentation on how they grow the carbon nanotubes. He explained about the wafers they are grown on and the process used to grow them called chemical vapor distillation. What many of the teachers found fascinating was the different designs one could make by growing the nanotubes. One can grow a nanotube in the shape of a UC logo and an American Flag by seeding an iron based composite catalyst the wafer they are grown on in certain places. Dr. Shanov also went over some of the other potential applications of carbon nanotubes. This included medicinal uses, electronic uses, and material uses. He spoke about how the army is interested in using these fibers woven into uniforms as antennae because the antennae now are so big they cause problems when soldiers are trying to stay camouflaged.

Towards the end Dr. Schulz gave a presentation on the possible medicinal uses of nanotubes. These included the targeted attacks on cancer cells which are normally not easy to single out and kill. The problem is that to kill cancer cells a lot of healthy cells are killed in the process. Using cellular markers unique to cancer cells, it is possible be able to target cancer cells directly. The drawback of this is that the nanoparticles are likely be trapped in the body and may cause damage. One possible way to fix this is to find a way to make the nanoparticles dissolve or self-destruct after the anti-cancer medication is delivered. At the end of the seminar the teachers were given a tour of the Nanoworld test facilities, shown below.



**Nanoworld Lab Facilities Shown During the Seminar**