Louisiana EPSCoR
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Clay Nanotube Pioneer Lvov Developing Market Applications

As the author of more than 220 peer reviewed publications receiving over 12,000 citations, Dr. Yuri Lvov, the T. Pipes Eminent Endowed Chair in Micro and Nanosystems at Louisiana Tech University, is one of the most highly cited chemists at the university today.

Dr. Lvov conducts his innovative nanotechnology research at the Institute for Micromanufacturing as part of the Louisiana Alliance for Simulation-Guided Materials Applications (LA-SiGMA). The LA-SiGMA consortium, funded by the National Science Foundation, is pushing the scientific frontiers in computational materials science.

"Yuri is one of the most published researchers in Louisiana Tech's history, and has received international recognition for his work. Yuri's average citation index is significantly higher than the national average for engineering researchers, and on par with scientists and engineers in the nation's most distinguished group of researchers," said Dr. Les Guice, President of Louisiana Tech University and Chair of the Louisiana EPSCoR Committee.

In addition to Dr. Lvov's enormous impact on research, he is a pioneer of two important nanotechnology methods: electrostatic layer-by-layer nanoassembly and building composite polymer materials with clay nanotubes.

Banner: "Greetings to famous overseas teacher Prof. Yuri M. Lvov." Dr. Lvov was elected Honorable Professor at Beijing University of Chemical Technology in Nov 2013.

His extensive career contributions to nanotechnology were recently recognized by the Alexander von Humboldt Foundation in Germany. The foundation awarded Dr. Lvov the prestigious Humboldt Research Award in chemistry, for his extensive groundbreaking work in chemistry of nano-scale systems.

Recipients of the $82,000 Humboldt award are internationally renowned senior research scientists whose fundamental discoveries or insights have had a significant impact on their own discipline and who are expected to continue producing cutting-edge innovations in the future.

Lvov is the first Louisiana scientist to receive this prize in chemistry. The nominations must be made by established academics in Germany, and Prof. Lvov was nominated by Technical University of Berlin, the largest engineering school in Germany. Lvov collaborates with Professor Regine von Klitzing on fundamental problems related to the new type of ceramic nanotubes for composite materials.

Halloysite nanotubes are naturally-occuring clay mineral cylinders that average 30 nanometers in diameter and are of great interest to industry. "They are environmentally friendly, inexpensive, and offer significant potential for commercial applications. Yuri was among the first to

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StormWall Industries LLC manufactures structurally engineered composite wall panel and ceiling systems that replaces the use of drywall in both residential and commercial construction. In collaboration with Louisiana Tech's Dr. Lvov, StormWall is investigating the use of halloysite and micro-manufacturing technology for improved fire retardancy and anti-microbial properties of our panel product. Whilst this technology is specific to StormWall's current needs, we have identified applications for use in paint, plastics and wood fiber industries that will expand its commercial potential.
- Scott Graham, CEO StormWall Industries LLC

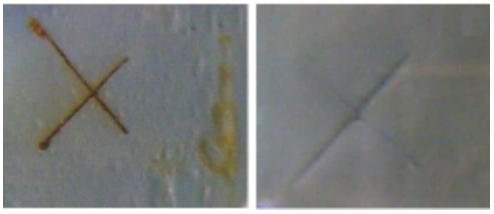
identify these nanostructures and realize their potential, and he remains one of the world's foremost authorities on the use of clay nanotubes for practical applications," said Guice.

Dr. Lvov has partnered with several companies to develop new commercial applications for clay nanotubes. Nanotubes can be filled with chemically active agents for many extended release applications, like pharmaceutical drug delivery, cosmetics, or petroleum cracking catalysts.

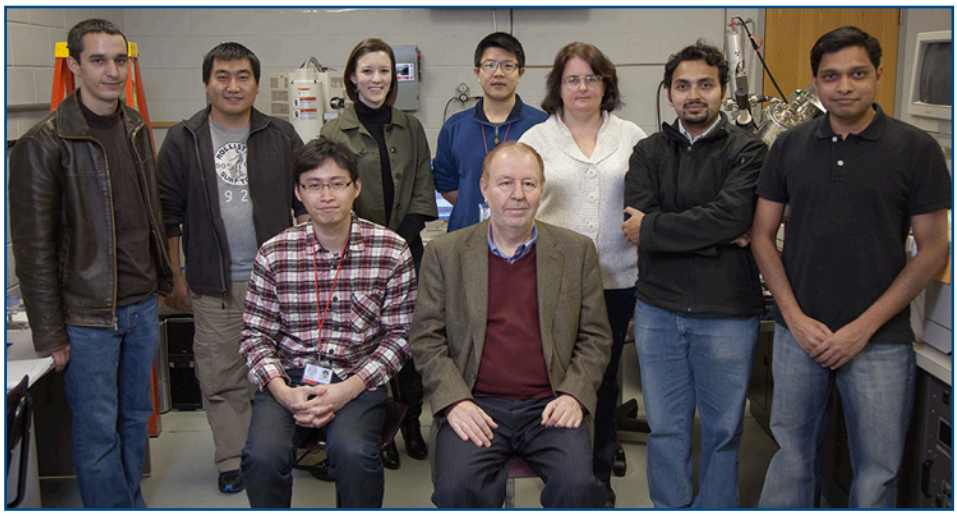
"About 2 years ago we initiated research work with Dr. Lvov on preparation of catalysts for the Fischer-Tropsch synthesis of fuels from natural gas. In the ceramics market, our main target is ceramic proppants for crude oil/gas exploration. We are targeting on penetrating all these markets and already started having some success. During this collaboration, we have developed several joint patent applications, which will help to develop new markets for halloysite," said Dr. Elshad Abdullayev, Research & Development Manager for Applied Minerals, Inc.

Coating or filling halloysite with metallic and composite substances creates a wide variety of electrical, chemical, and physical properties beneficial to industry, such as flame-retardant paints, anticorrosion coatings, and enhanced tensile, impact and adhesive strength for building materials and plastics.

One such product Dr. Lvov is developing with LA-SiGMA researcher Dr. Pedro Derosa of Grambling University, is a self-healing anti-corrosion paint. They have partnered with Cameron International, PPG Industries and Schlumberger to develop this new product. Halloysite nanotubes are filled with anti-corrosion agents and added to the paint. When the dried coating is damaged, the nanotubes release the anti-corrosion agents which then seal and protect the exposed area.



Corrosion test results on steel coated with regular paint (left) and coated with a halloysite paint composite with self-healing properties (right).



Dr. Lvov and his research group in their laboratory at Louisiana Tech University's Institute for Micromanufacturing (IfM).

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