

NANO NEWS - SOUTH AFRICA

Volume 6, July 2010

Edited by Patience Iyuke

Co-edited by Neil Coville

Introduction

As will be seen in this newsletter, three events of interest to the nano community will take place in the next 6 months. These include, the National Nanotechnology Health, Safety, & Environmental Workshop to be held at Farm Inn, Pretoria, the SAIP (SA Institute of Physics) meeting at the CSIR, Pretoria and the SACI (SA Chemical Institute) Convention taking place at the University of the Witwatersrand. Both will have sessions of interest to those working in the nano field and will attract top class speakers. Check the articles below for the web page details – for abstract and registration information. The SANi student chapter continues to do good work and information on their trip to the Eastern Cape makes interesting reading.

Neil Coville

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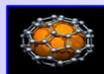
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Editorial from the SANi Chairman

Greetings from the SANi office. I hope that you are enjoying the World Cup just as I am and that it has not proven to be too disruptive to your work. I welcome this opportunity to share some developments in the local nanotechnology scene.

The next NanoAfrica conference (NanoAfrica 2011) is planned (provisionally) for April 2011 in Gauteng. We are in the process of setting up the organizing committee and would welcome nominations from all SANi members. The conference will again have a strong African presence and contributions from the entire nanotechnology world are expected. We expect that the number of papers and posters will at least match the 300 contributions presented during NanoAfrica 2009. The conference website will be up and running soon and further details will be contained therein.

I wish to thank the organizers of the National Young Researchers Symposium (NYRS) for the sterling work leading up to this very successful event. The turnout and the quality of the presentations were fantastic. A big thank you to the UJ's Faculty of Science and Department of Chemical Technology for hosting the event.



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Planning for the next event (most likely in the Western Cape) is already under way and you should receive information about that soon. Other regions will be covered as well within the next year or so.

Please take note of the NEP and NNEP calls and deadlines thereof as well as travel grants which I am reliably informed are rarely fully taken up. More information is available on the NRF website.

The SANi executive committee has identified international networking as an area that needs particular attention and in this regard, contacts will be established with similar organizations in other countries. The first among these could be a discussion with the USA nanotechnology society through Susan Cozzens who recently visited the country.

Discussions between SAASTA and SANi have taken place which may affect the nature of this newsletter. Current thinking is on the expansion of the newsletter to include articles targeting a wider readership which includes FET Science teachers and their scholars. This is aimed at attracting the attention of a younger readership and stimulating an interest in nanotechnology at the pre-university stage. Expect a quarterly nanotechnology magazine / newsletter towards the end of this year. Discussions in this regard are continuing and more information will be provided as it becomes available.

Take note of the SACI 2011 call for papers in this edition. A strong nanotechnology participation is expected.

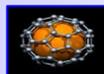
This edition also includes Messai Mamo's report on his recent visit to Brazil which illustrates what is being achieved through IBSA and hopefully will spur other researchers to take advantage of the funds that have been made available to encourage collaboration between the three countries.

The report from the Student's Chapter is a regular feature of this newsletter which I hope will encourage students to submit brief reports on their activities. These should be directed to the chairperson, Nikiwe Kunjuzwa at nikikunju@yahoo.co.uk.

Finally, I hope you will be inspired by recent breakthroughs achieved locally by Prof V. Pillay's group as well as the Sasol/UCT collaborative effort. It is gratifying to see that the investment in nanotechnology is bearing fruit.

I hope you find this edition informative and I would like to hear from you on what improvements you would like to see. Please address these to celelm@tut.ac.za or patience.iyuke@wits.ac.za.

Leskey M. Cele
Chairman, SANi



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Brazil trip - Applying Carbon Nanomaterials to Device Synthesis

In March/April 2010 I was fortunate enough to spend time in Brazil (Campinas, Curitiba) as part of my short term Postdoctoral Fellow (PDF) studies. The trip was part of an IBSA (India, Brazil and South Africa) programme with financial support granted from Pró-África-CNPq and I was hosted by the Departamento de Física Universidade Federal do Paraná (Prof Ivo Hummelgen).

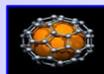
During the time I spent in Brazil (about 8 weeks) we explored the applications of carbonaceous materials, and carbon nanospheres in devices applications. Polymer composite of nanospheres were used in sensors and organic vapour detectors (e.g. methanol, ethanol, toluene and others organic vapours) and the devices could detect to 0.3 ppm level of methanol in air. The other area which we explored was the use of carbon containing devices as a hydrostatic pressure sensor, based on carbon sphere-polymer composites via the study of the pressure dependence of the conductance and capacitance of the devices. The polymer composite of nanospheres interestingly responded to changes in pressure as high as 217 kPa and also under vacuum. The application of polymer carbon nanosphere composites in a write-once-read-many-times memory (WORM) device was also studied. A thin film of carbon nanospheres and cross-linked polymer composites, was sandwiched between an Al bottom contact and either an Au or Al top contact (300 nm thickness in both case). These simple sandwich structure memory devices showed WORM characteristics with an ON/OFF current ratio of 10^8 at 1 V bias when Au was used as top contact. The write operation corresponded to an OFF/ON transition that could be made at low voltages, of ca. 2 V. Similarly the nanospheres were also studied in organic transistors as well as inorganic photovoltaic devices. Two papers were submitted to the Journal, Organic Electronics from these studies: on hydrostatic pressure sensors and on non volatile memory, write-once-read-many-times devices.

Messai Mamo,
Chemistry, Wits

National Nanotechnology Health, Safety & Environmental Workshop

Purpose of the workshop

South African Government policies, in particular the National Nanotechnology Strategy (NNS) (2004) and National Research and Development Strategy (NRDS) (2002) envisage the beneficial use of nanotechnologies as a suitable platform to achieve or enhance sustainable social and economic growth. The NNS reflects recent global technological advancements as a result of increased capabilities in the manipulation and manufacture of materials at nanoscale – which encompasses several industrial sectors. Subsequently, the nanotechnology driven capabilities



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have yielded substantial successes of diverse industries with major positive impact – not only on technological progress, but on health, the environment, and the social well-being.

There is, however, presently rapidly growing global concern over the safety, health, and the environmental implications of nanomaterials. Therefore, the core of this second Nanotechnology health, safety, and the environment workshop (hereafter Nano-HSE workshop) workshop is to find mechanisms of developing a strategic road-map that will in future guide South Africa in addressing systematically the potential risks of nanomaterials. As such, from this workshop it is expected that a process of developing a National Research Science Plan will be discussed and agreed. The Science Plan will inform:

- (i) The research programmes to be initiated;
- (ii) Skills development mechanisms;
- (iii) Development of required research infrastructure;
- (iv) Mechanisms adopted of supporting national and international collaborations; and
- (v) Outlining the required funding levels, and the potential sources.

In addition, to create a suitable platform that aids in achieving goals outlined from points (i) to (v) above.

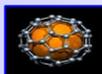
Secondly, the workshop provides a forum of consolidating the progress achieved over the last two years of the nanotechnology risk assessment initiative led by the Department of Science and Technology. This will include reflecting on the outcomes and learning derived from the first workshop held in March-April 2009.

Thirdly, the workshop seeks to provide a forum where consensus should be reached on the criteria and principles that inform what is included in the Science Plan, the structure and form of the Science Plan, long-term (+10 year) Research Focus Areas, the prioritization of the Research Themes for each Focus Area and the key activities and research questions associated with the first 3 - 5 year period for each of the Research Themes.

Through open public processes, the broader stakeholder body will then be invited to comment on the document. The Science Plan will be subjected to several rounds of iteration and will include review of the Science Plan by national and international scientists. The Science Plan is expected to be ready by March 2011.

Date of the workshop: 14th-15th July 2010

Venue: Farm Inn, Pretoria . <http://www.farminn.co.za/>



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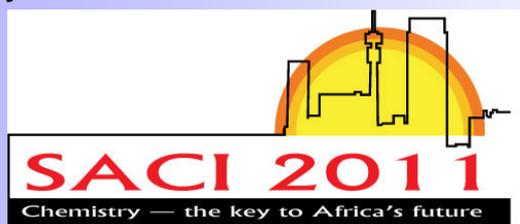
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Submitted by: Marlene Jivan, CSIR, Pretoria.

SACI Convention 2011

40th South African Chemical Institute (SACI) Convention incorporating the 3rd Federation of African Societies of Chemistry (FASC) **16 - 21 January 2011**

INORG2011 will also be held in conjunction with the Convention.
More information on the SACI website. www.saci2011.org.za/INORG2011/
16 - 21 January 2011



Call for abstracts

Offers of abstracts for presentation within any of the themes of the congress are invited. See www.saci2011.org.za for details

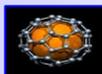
Key Dates:

Abstracts due:	15 August 2010
Notification of acceptance of abstracts:	1 September 2010
Early bird registration:	15 September 2010
Booking of accommodation:	15 September 2010

Plenary Speakers

- Sir David King
- Herbert Waldmann

The conference will take place on the campus of the University of the Witwatersrand.



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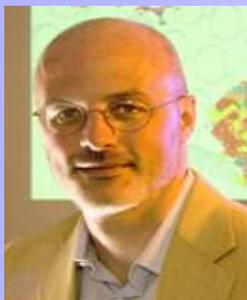
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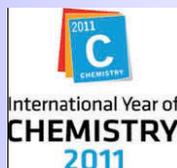
- Boguslaw Buszewski
- Dwight Sweigart
- Vincent Rotello
- Berhanu Abegaz
- Tebello Nyokong
- Martyn Poliakoff
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Plenary Lecturer in Materials Division of Programme

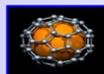


Vincent Rotello is the Charles A. Goessmann Professor of Chemistry at the University of Massachusetts at Amherst, with an appointment in the Program in Molecular and Cellular Biology. He has been the recipient of the NSF CAREER and Cottrell Scholar awards, as well as the Camille Dreyfus Teacher-Scholar, and the Sloan Fellowships, and is a Fellow of the American Association for the Advancement of Science (AAAS) and of the Royal Society of Chemistry (U.K.). He is currently an Executive Editor for Advanced Drug Delivery Reviews and Associate Editor for North America for the Journal of Materials Chemistry, and is on the Editorial Board of nine other journals. His research program focuses on engineering the interface between hard and soft materials, and spans the areas of devices, polymers, and nanotechnology/bionanotechnology, with over 300 papers published to date.



For more information on the convention, please visit <http://www.saci2011.org.za/>

Posted by Laila Hughes, South African Chemical Institute.



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SANi Student Chapter Report

Introduction

The SANi Student Chapter, governed by SANi has undertaken a major initiative to publicise the existence of Nanotechnology to the high level education system, as well as to the public. As a mandate from the Department of Science and Technology (DST), SANi governs SA's interest in Nanoscience and Nanotechnology, creates public awareness and facilitates academia-industry partnership.

Due to the increase in number of students doing research in the field at universities, technikons and science councils, SANi realized the need of the student body, which would oversee the interests of the postgraduate students in South Africa (SA). Thus the SANi Student Chapter was launched at the Nanoschool in Pretoria, November 24 2009.

Major objectives of the Chapter are to maintain a student database, provide information regarding the availability of instruments, organize symposia and identify funding for students.

The first meeting of the Student Chapter held at Wits, February 19, 2010, attended by the newly elected committee, discussed the election of subcommittees of the chapter at all SA universities where the scope of Nanotechnology is of research interest. The plan was to take an advantage of Prof. Paul O'Brien's visit to the Eastern Cape, where he was scheduled to deliver a lecture at four universities of the province namely; NMMU, Rhodes, Fort Hare and WSU. SANi approved and funded the idea.

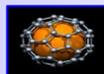
At all varsities, the SANi Student Chapter Chairperson (Ms. Nikiwe Kunjuzwa) had scheduled a session with all the nanotechnology students.

1. **Visit at Nelson Mandela Metropolitan University: March 08 2010**

Most students attended the talk by Prof Paul O' Brien, but unfortunately no student was interested in the elections of the SANi Student Chapter subcommittee. The chairperson spoke to one student who was still doing his 3rd year level of study.

2. **Visit at Rhodes university: March 09 2010**

A warm welcome was received from very enthusiastic and passionate students. A subcommittee lead by Mr. Samson Khene, a PhD student was formed. About 20 students were registered under SANi student chapter. Discussions were centred on symposia, accessibility of instruments, university collaborations, etc. Two students (Ms Sharon Moeno and Mr. Vongani Chauke) volunteered to help in manning SASTA table at Sci-fest



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which was 2 weeks later, and SAASTA gave them a token of monetary appreciation in return. This really helped in achieving one of the objectives of the Chapter....Big ups to Rhodes Nano students!!

3. Visit at Fort Hare university: March 10 2010

A subcommittee, chaired by Mr. Pardon Nyamukumba, an MSc student was elected. He has 22 students under his leadership and all are thirsty for collaboration with other universities. Most students who attended are still doing the undergrad studies but are keen to take research in Nanotechnology. Their concerns are the availability of instruments and the funding they could get to attend conferences such as NanoAfrica. Visiting Fort Hare and Rhodes gave more reasons to have the Eastern Cape Nanoscience Young Researcher's Symposium early in 2011.

4. Visit at Walter Sisulu university: March 11 2010

Due to reasons beyond control, students did not show up. So no subcommittee was elected.

The entire trip was a success

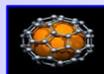
*Written by: Nikiwe Kunjuzwa,
SANi Student Chapter Chairperson,
PhD Chemistry Student, Wits.*

Nanotech Blazes Biomedical Trail



Innovations in nanotechnology have to move beyond patents and become available for use, says Wits University professor of pharmaceuticals, professor Viness Pillay.

Local researchers are using nanotechnology to pioneer breakthroughs in medical science that could radically change the way diseases such as tuberculosis and type two diabetes are treated, or prevent them from occurring all together.



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Professor Viness Pillay, professor of pharmaceuticals and NRF research chair in the Department of Pharmacy and Pharmacology, at Wits University, says working at the nanoscale allows researchers to harness new properties of particles, as they behave differently at an atomic level.

Nanoparticles have dimensions in nanometres (nm), or one billionth of a metre. To get an idea of the size, picture a human hair – that's a hefty 80000nm. While nanoparticles are generally defined as structures with dimensions of less than 100nm, for biomedical purposes, it's often necessary to go much smaller.

For the kind of drug delivery systems Pillay is involved in, for example, researchers need to go down to around to 25nm, so they can start playing at the cellular level. At this size, he explains, nanoparticles can play a role in intra-cell drug delivery. "We don't just want the drug to circulate in the bloodstream; we want it to get inside the cell."

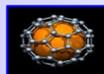
According to Pillay, there are many disorders, including motor neuron diseases, where a genetic alteration has occurred inside the cell, which needs repairing in order to treat it. "Many current treatments for neurodegenerative diseases merely prolong the patient's life, without being able to cure the disorder," explains Pillay. "Nanotechnology enables drugs to work on the mitochondria inside cells, which might have undergone a genetic alteration."

Pillay serves as director of the Wits Drug Delivery Platform (WDDP), where a team of over 50 researchers is working on several technologies that have potential for commercialisation. His research essentially involves working on nanostructures to be able to target specific areas in the body, to create efficient drug delivery systems.

"Nanostructures are composed of a host of archetypes – nanoparticles, nanotubes, nanosensors; so you focus on choosing an archetype and design depending on which area of the body you want the drug to target."

Another application, which sounds grimmer than it is, is an intra-ocular implant. "The 'Bio response intelligent intracellular ocular implant', or BI3, works in response to inflammation," explains Pillay. It's for posterior segment disorders, where inflammation occurs deep within the eye, which eye-drops can't get to. The biodegradable system, about 5mm in diameter, is implanted in the back of the eye and releases both an antibiotic and anti-inflammatory.

"The nano-enabled system is intelligent and bio-responsive because it reacts only in the presence of inflammation," notes Pillay. He explains that inflammation releases free radicals, which react with the polymer system, which degrades to release the drug. "The implants are tailor-made for the patient, depending on the severity and period of the inflammation. In some cases, such as patients in advanced stages of HIV, if you don't treat posterior eye disorder they can go blind."



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While most of the technology is still in the preclinical phase, Pillay says some projects will soon undergo “first-in-man” studies, and they plan to test the technology further. This will hopefully be enabled by funding from the Department of Science and Technology's Technology Innovation Agency, which has invested more than R25 million in the Wits platform.

Tiny tools

Dr Thavi Govender, from the University of KwaZulu-Natal's School of Pharmacy and Pharmacology, is investigating the use of nanoparticles to create both an artificial enzyme and a chaperone molecule to help prevent proteins from accumulating around cells. This could be used to treat diseases such as Alzheimer's and type two diabetes, which fall under a class of disorders where amyloid protein build-up takes place.

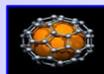
Govender says the aim is to combine the work of two research groups to create a new method for evaluating potential type two diabetes drugs. “Type two diabetes is the biggest killer in the world, and the main problem is there's no tool for pharmaceutical industries to determine how well another molecule will bind the protein,” says Govender. “They usually have a bank of 10 000 or 20 000 molecules, which they can screen until they get a hit, but there's no tool for them to use for these diseases,” he explains.

The UKZN team, working in collaboration with researchers from pharmaceutical company Astrazeneca, hopes to derive a rapid methodology for analysing new drug efficiencies. “We wish to develop a method whereby novel potential type two diabetes inhibitors can be rapidly tested. Govender says the first step is synthesising modified amylin proteins.

“People have always dreamed of making an artificial enzyme, as it could lead to the ultimate cure for any disease. With nanoparticles, it could be possible to make a structure that behaves like an enzyme. It's a dream at the moment, but we believe it can be done.”

Another aim, notes Govender, is to investigate the use of nanoparticles to act as an inhibitor for these disorders. They're exploring the possibility of applying specially designed nanostructures that are membrane-bound, to prevent the accumulation of peptides into insoluble plaques. This may lead to a new approach in anti-diabetic therapeutics, he adds.

Govender explains that the diabetes-associated peptide is secreted by pancreatic beta-cells, together with insulin. This protein can cause damage when it aggregates outside the cells and comes into close contact with cell membranes. His team is trying to create a chaperone protein, which carries certain molecules from place to place in the body. ” . ”Using nanoparticles, which are taken up quickly by cells, to



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bind the protein, means it will be absorbed into the cell where it can be destroyed.”

While several drugs are available for non-insulin-dependent diabetes, Govender points out that these agents simply maintain insulin at 'normal' levels, rather than preventing the progression of the disease. “We have already identified which molecules can treat the problem, and we're now in the process of determining how to deliver molecules to the right parts of the body.”

The main aim, says Govender, is taking these innovations from the lab to real life. “As scientists, we never do something just for the sake of it; we're trying to make a difference.”

Beyond the lab

While it's one thing working on cutting-edge solutions in a lab environment, it's quite another bringing them to market. Pillay says for every product being developed as part of the WDDP, they apply for patents in SA, and also in the US, UK, and Japan, where the major pharmaceutical players are situated.

According to Pillay, their research work incorporates two approaches – a scientific model and a business model. “We work in close conjunction with our technology transfer office, Wits Enterprise, which is involved in the commercialisation of the technology down the road.

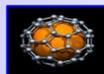
“What we want is for these technologies to become available to patients to use. We don't just want to create a whole lot of patents to sit on a shelf or publications in journals – it must be available for use.”

He adds, however, that this is not an easy process. “It involves discussions with large multi-nationals, venture capital companies, angel funders, and so on. We really want to showcase the technology so people can see its advantages and investors can get involved.

“We're prepared to show government the superiority of the technology, and hopefully get them to fast-track the technology and get it to market, without compromising the scientific process.”

He notes that, while funding for nanotechnology is being made available, nanoscience is a very expensive field. “The equipment, especially imaging tools, is very costly – we have recently been awarded an imaging system for R8 million.”

Govender adds that government prioritises HIV, TB and malaria-related research, as these are major concerns for SA and Africa. “Our country is doing the right thing by focusing on what the problems are in SA.”



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Uncharted territory

While these advances herald significant breakthroughs in preventing and treating disease, there are still many unknowns regarding the long-term effects of using nanoparticles inside the body.

“Internationally, scientists are running into highly restrictive regulatory barriers,” explains Pillay. “You can come up with a fantastic product, but get nowhere because the regulations around nanotechnology are very hazy.”

He explains that, from a scientific viewpoint, the concern is understandable. “If you take molecules from their normal state to the nanostate, you change their chemistry completely, and if you aren't careful enough, it could create toxicity in cells, genetic mutations – there's a huge debate going on around toxicity.”

Govender adds that scientists have to consider the implications if nanoparticles are sitting all across the body, or stored in various organs. “We don't really understand what happens, but we're exploring the positive aspects of the technology, and seeing what it can do, and then we'll work around the potential negative aspects.”

“There are challenges, but you shouldn't stop scientific progress because of challenges, says Pillay. “It should spur you on to prove which are non-feasible technologies, and which can be fantastically enabling.”

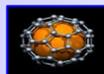
In future, predicts Pillay, nanotechnology's role in healthcare could bring about effective disease prevention systems. “I foresee people looking at bio-robotic-type systems, where a nanochip will potentially be able to detect diseases before they manifest by monitoring the body's biochemical and genetic make-up.

“For example, one of our projects involves nanosensors that could detect changes in the biochemical climate and feed it back into the biological system.” Through this feedback loop, explains Pillay, you can change things in the system before they develop into potentially life-threatening illnesses.

**Source: *Lezette Engelbrecht, ITWeb copy editor and journalist
Johannesburg, Jun 2010***

[http://www.itweb.co.za/index.php?option=com_content&view=article&id=33773:nanotech-blazes-biomedical-trail&catid=146\[08/06/2010 11:19:59\]](http://www.itweb.co.za/index.php?option=com_content&view=article&id=33773:nanotech-blazes-biomedical-trail&catid=146[08/06/2010 11:19:59])

**Submitted by: *Professor Viness Pillay
Department of Pharmacy & Pharmacology, Wits.***



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Sasol and UCT Catalysis Research Partnership Yields New Invention

A research partnership between petrochemicals group Sasol and the University of Cape Town (UCT) has led to the invention of a new device, called the Magnetometer, that enables scientists to examine ferro-metallic catalysts.

The researchers, including Michael Claeys and Eric van Steen of UCT and Jan van de Loosdrecht and Kobus Visagie of Sasol Technology, expected the fully computer-controlled device to add great value to research in a number of fields, including nanotechnology.

Sasol noted that catalysts such as cobalt are used in the production of a variety of fuels and play a key role in terms of product performance.

“The device uses a large electromagnet to magnetise the catalyst, which is placed in a small reactor in which industrial conditions with high pressure and temperature can be realised. The purpose of this area of research is to examine the physical changes that catalysts undergo during process situations which have an effect on catalyst performance,” Sasol explained.

The Magnetometer exploits the magnetic properties of these catalysts to obtain the required information.

The researchers have filed a joint international application to patent the device.

Edited by: Creamer Media Reporter

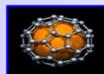
Source: Engineering News:

<http://www.engineeringnews.co.za/article/sasol-and-uct-catalysis-research-partnership-yields-new-invention-2010-06-01>

Nanotechnology Yields Advance in Heat Transfer, Cooling Technologies

Researchers at Oregon State University and the Pacific Northwest National Laboratory (PNNL) have discovered a method to apply nanostructure coatings to make heat transfer more efficient, with potential applications in high-tech devices and the conventional heating and cooling industry. The coatings can remove heat four times faster than the same uncoated materials, using inexpensive materials and application procedures. The findings were reported in the International Journal of Heat and Mass Transfer (“Enhancement of pool boiling heat transfer using nanostructured surfaces on aluminum and copper”), and a patent application has been filed.

Heat exchange has been a significant issue in mechanical devices since the



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Industrial Revolution. Heat exchangers enable modern air conditioners and refrigerators to function, and inadequate cooling is a limiting factor for many advanced technology applications, from laptop computers to advanced radar systems. "Many electronic devices need to remove a lot of heat quickly, and that's always been difficult to do," says Chih-hung Chang, PhD, associate professor in the School of Chemical, Biological, and Environmental Engineering at Oregon State. "This combination of a nanostructure on top of a microstructure has the potential for heat transfer that's much more efficient than anything we've had before."

The researchers coated heat transfer surfaces with a nanostructured application of zinc oxide, which in this usage develops a multi-textured surface with capillary forces that encourage bubble formation and rapid replenishment of active boiling sites. The researchers used water in their experiments, but other liquids with different cooling characteristics could be used as well, they say. The coating of zinc oxide on aluminum and copper substrates could affordably be applied to large areas, so the technology has the potential not only to address cooling problems in advanced electronics but also could be used in more conventional heating, cooling, and air conditioning applications.

Sources: Nanowerk: <http://www.nanowerk.com/news/newsid=16643.php> and TechTransfer:<http://www.technologytransfertactics.com/content/2010/06/16/nanotechnology-yields-advance-in-heat-transfer-cooling-technologies/>

Submitted by: Robert Caveney, Wits Enterprise

Nano Image Contest: Carl Zeiss 2010 Contest

All users of ZEISS electron and ion microscopes around the world are invited to enter the first Carl Zeiss Nano Image Contest. Entries to the online competition can be submitted until August 29, 2010, on the NTS websites. The website with the collection of the Nano-masterpieces is open to anyone who wants to view and vote on the submitted images. There are four categories: TEM, SEM, Cross Beam and HIM (Helium-Ion Microscope). Surely, there must be a prize? Of course!

The winner from each category will receive a [Carl Zeiss Cinemizer!](#)

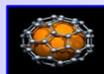
Submit those images that truly take your breath away and that provide Maximum Information - Maximum Insight. <http://nanocontest.smt.zeiss.com/cms/website.php>

Source: Siyabulela Sihlali

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Forthcoming Nanoscience and Nanotechnology Events

Local Events:

- i) The Development of the National Nanotechnology Health, Safety and Environmental Research Platform Workshop, Farm Inn, Pretoria, 14th-15th July, 2010. Please contact: Mrs Marlene Jivan, Project Manager, Council for Scientific and Industrial Research. Email: mjivan@csir.co.za
Ph: +27 12 841 3172
- ii) South African Institute of Physics (SAIP) Annual Conference. The 55th Annual Conference of the SAIP, CSIR International Convention Centre, Pretoria, 27th-1st October 2010: <http://www.saip.org.za/SAIPConferences.html>
- iii) The 40th SACI Convention Incorporating the 3rd FASC Congress, University of Witwatersrand, Johannesburg, South Africa, 16th-21st January 2010
<http://www.saci2011.org.za/>

International Events

- i) Challenges in Physical Chemistry and Nanoscience (ISACS2), Budapest, Hungary, 13th-16th July 2010.
<http://www.rsc.org/ConferencesandEvents/ISACS/PhysicalChemistryandNanoscience/index.asp>
- ii) ICBN 2010 "International Conference on Biotechnology and Nanotechnology" Paris, France, 28th-30th July 2010.
<http://www.goingtomeet.com/60266> &
<http://www.waset.org/conferences/2010/france/icbn/>
- iii) Taiwan Nano Exhibition, Taipei World Trade Centre, Hall 1, Taipei, Taiwan, 7th- 9th October 2010 : <http://nano.tca.org.tw/index.php?lang=e>
- iv) Nanosafe 2010, Minatec, Grenoble (France) 15th-19th November 2010.
More information: <http://www.nanosafe.org/>
- v) The 2010 International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, Hawaii, USA, 15th-20th December 2010
<http://www.pacifichem.org/>