

ESA Newsletter

Electrostatics Society of America - The Friendly Society

President's Message

Our 2006 Electrostatics Joint Conference was a great success thanks to the hard work of our authors, presenters, and organizers. At our Welcome Reception on Tuesday evening, we greeted old friends and made new ones. 112 people registered for the conference, making this among our largest ESA conferences. Over 100 oral presentations and posters were given over the course of two and a half days, with time for discussions and refreshments. At our Thursday evening banquet, I am proud to have presented an all-time high 39 "kite and key" pins to celebrate authors making their first presentation at an ESA Conference. After dinner, Al Seaver delighted us with a presentation on the Hindenburg disaster on May 6, 1937 at Lakehurst, New Jersey. While a static spark is thought to have ignited the hydrogen in the airship, the official investigations leave some doubt, and the root cause of the disaster remains a mystery. Al invited the audience to serve as independent investigators as he described 3 scenarios for the disaster.

Over 60 people attended our Friday morning technical session. At the conclusion, Prof. Sheryl Barringer announced the winners of our Mystic Tan Student Paper Competition. Of the 17 student authors participating in the competition, 8 were recognized for presentation excellence.

Prize	Student	Title
1st	Audrey Bourgeois Université de Poitiers	Flow Electrification In Power Transformers: Acid-Base Interactions At The Oil-Pressboard Interface
1st	Enka Dervishi Univ. of Arkansas at Little Rock	Transparent and Electrically Conductive Carbon Nanotube-Polymer Nanocomposite Materials For Electrostatic Charge Dissipation
1st	Lin Zhao Univ. of Western Ontario	Electrohydrodynamic Flow In A Single Wire-Plate Electrostatic Precipitator
2nd	F. C. Lai Univ. of Oklahoma	Numerical Study Of EHD-Enhanced Water Evaporation
2nd	M. Rahman Toyoashi Univ. of Tech.	Development Of The Addressing Technique Of Nanoparticles Using Triple-Stranded DNA Formation For Microelectronic Wiring
2nd	Jiacheng Zhang Univ. of Western Ontario	A Dynamic Model For Negative Corona Discharge In Point-Plane Configuration
3rd	S. Haq Univ. of Waterloo	Analysis Of Space Charge And Dielectric Relaxation In Medium Voltage Magnet Wires By Using Thermally Stimulated Depolarization Currents (TSDC)
3rd	Keiichiro Yoshida Osaka Prefecture Univ.	Numerical And Experimental Analysis Of Nanosecond Pulse Dielectric Barrier Discharge-Inducted Nonthermal Plasma For Pollution Control

The ESA society is grateful to MKS/ION Systems, Inc. of Alameda, CA for their help in organizing the local arrangements. A special note of appreciation is extended to Scott Gehlke and Sheri Tam for their efforts. The conference thanks Mystic Tan, Inc. for their financial support of the student paper competition. Thanks to Steve Cooper who coordinated the grant with Mystic Tan.

For our 2006 Conference, special thanks go to:

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| ✓ Scott Gehlke, Conference chairman | ✓ Tetsuji Oda, IEJ |
| ✓ Lucien Dascalescu, IEEE-IAS EPC Committee | ✓ Gerard Touchard, SFE |
| ✓ Peter Gefter, Technical Co-chair | ✓ Joseph Crowley, Technical Co-chair, Publisher Proceedings |
| ✓ Sheri Tam, Administrative Assistant | ✓ Barbara Crowley, Administrative Assistant |
| ✓ Mark Horenstein, Website management | ✓ Al Seaver, Banquet Speaker |
| ✓ Mark Zaretsky, ESA Newsletter | ✓ Sheryl Barringer, Student Competition Chairperson |
| ✓ Kelly McCartney, Bancroft Hotel, catering | ✓ Wendy Strange, Facilities Manager, UC Berkeley International House |

I am pleased to announce that our 2007 ESA Conference will be organized by Prof. Raji Sundararajan, Conference Chair and Prof. Sheryl Barringer, Technical Chair. The venue will be the campus of Purdue University, West Lafayette, Indiana. We will choose the dates in the near future, though I expect that we will return to our traditional time in late June.

Kelly Robinson, ESA President

Current Events

Spectacle users may get crystal clear vision at flick of a switch

Alok Jha, Tuesday April 4, 2006, *The Guardian*

Spectacle-wearers will soon be able to say goodbye to the humble bifocal lens, trusted friend of ageing eyes. Scientists have developed new flat lenses that can change their focusing power at the flick of a switch, allowing the wearer to change their focus from the horizon to something a few inches away in a split second.

As eyes age, their outer layers lose flexibility, leading to an inability to shift focus from distant to near objects - a condition called presbyopia. Bifocal lenses, where the top and bottom of the spectacles have different focal lengths to help eyes deal with differing distances, are useful for presbyopes but the wearer has to shift their gaze between the different parts of the lens for different tasks.

"The field of view is limited in such eyeglasses, requiring the user to gaze down to accomplish near-vision tasks and in some cases causing dizziness and discomfort," said Guoqiang Li and Nasser Peyghambarian, of the University of Arizona, in a paper published yesterday in the *Proceedings of the National Academy of Sciences*.

Their solution is a lens that consists of transparent concentric rings which control the focusing power of a thin layer of liquid crystal sandwiched between a couple of layers of glass.

When an electrical current is passed through them, the concentric rings, which are electrodes operating at low voltage, take less than a second to change the focal power of the liquid crystals. Dr Li's technology allows the whole area of the lens to be used to focus at different distances. If electrical power is suddenly lost, the lens becomes as transparent as everyday glass. The researchers said that this makes the new lens safe for use while driving.

(Excerpted from <http://www.guardian.co.uk/science/story/0,,1746117,00.html>)

Nanofibers created in orderly fashion

Liese Greensfelder, *Media Relations*, 12 April 2006

For 72 years, scientists have been able to use electric fields to spin polymers into tiny fibers. But there's been just one problem: Like worms that won't stop wriggling, the fibers tangle randomly almost as soon as they are created.

When Daoheng Sun, a professor of mechanical and electrical engineering from China's Xiamen University came to Liwei Lin's laboratory at UC Berkeley for two years with the Berkeley Scholars Program in 2004, he looked

around for a suitable research project. He and Lin, a professor of mechanical engineering, came up with the idea of trying to tame the electrospinning process to make orderly arrays of fibers.

What they attained with their innovations are fibers ranging from 50 to 500 nanometers in diameter that are deposited onto a collector plate in a directed, controlled manner. In reference to the shortened distance between the ejector and collection points that it used, the team named the new process "near-field electrospinning."

Sun and Lin's method varies in four important ways from the conventional method of electrospinning.

First, instead of applying the polymer solution into the electric field with a syringe, they used a fine-tipped tungsten electrode, which they dipped into the solution like a pen into ink. Then, positioning the electrode above a collection plate, they applied electrical voltage to it, creating the electric field and initiating the process of electrospinning with the tiny drop of polymer on the electrode's tip. This allowed the team to reduce the initial diameter of the polymer stream as it leaves the electrode far below the diameter of the stream produced by the conventional syringe.

Second, the researchers shortened the distance the polymer travels in the electric field from the conventional 10 to 30 centimeters to between one-half millimeter and three millimeters. This allowed them to take advantage of the brief period of stability that polymer fibers exhibit when the electrospinning process begins. Just like the exhaust of a jet engine that shoots out in a straight line before billowing into random patterns, the fibers move in a relatively straight line for a fleeting moment when they enter the electric field. In Sun and Lin's near-field technique, the fibers are captured before their billowing begins.

The shortened distance also meant that Lin and Sun could dramatically reduce the voltage required from 30,000 volts to as low as 600 volts. Because the strength of an electric field is determined by voltage divided by distance, the shorter field maintains the same strength even with less applied voltage.

Finally, rather than using a screen fixed in place to capture the fibers, Sun and Lin let the fibers land on a plate that could be moved in various patterns at various speeds. This allowed the researchers to pattern the fibers onto the plate the way a quilter creates a design by maneuvering fabric under her sewing machine's needle.

Lin said he foresees the possibility of two immediate directions for the new process. One is for device applica-

Current Events (cont'd.)

tions that require precise deposition of the nanofibers, such as making nanosensors for biological measurements - a glucose monitor, for instance. The other will be to make non-woven fabrics with organized patterns that can have many applications, such as scaffolds for living cells. Near-field electrospinning may also be useful in nanolithography for making next-generation microchips, Lin predicted. But, he said, this will require more effort to develop.

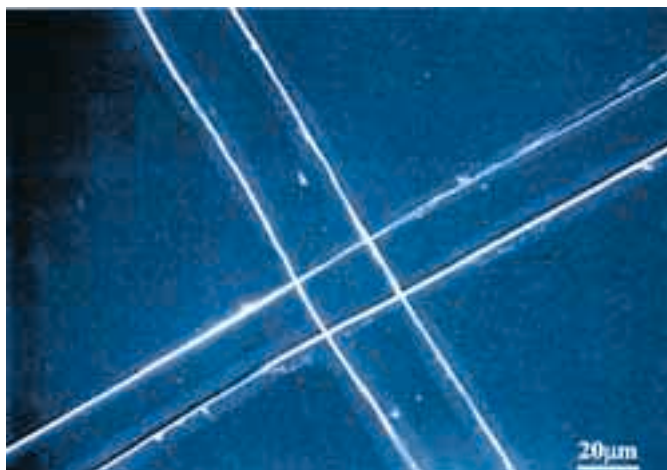
Lin is currently working on two improvements to the near-field process: an electrode that can provide a continuous supply of polymer and a movable stage with good planar control to capture the fibers.

(Excerpted from http://www.berkeley.edu/news/media/releases/2006/04/12_nanofibers.shtml)



Above: Grad student Chieh Chang wrote the word "Call" using a new electrospinning technique developed in Liwei Lin's laboratory at UC Berkeley. Ron Wilson photos

Below: These orderly rows of nanofibers were created using the new near-field electrospinning process. Until now, electrospinning produced random tangles of fibers.



ESA OFFICERS

President	Kelly Robinson, Eastman Kodak
Vice President	Sheryl Barringer, Ohio State Univ
Executive Council	John Gagliardi, Rutgers Univ. Steve Cooper, Mystic Tan Nathaniel Green, U. of Bloomsburg

Sources and Sinks

Here is an observation/question from one of our members, David Feavearyear. Please respond to dfeavearyear@imrtest.com.

I have a question for the newsletter (or the conference), My wife (an RIT physicist) has been doing an experiment with kids and we are trying to find out if it involves electrostatics.

Place a magnet inside a balloon and blow it up to normal size. Take a second magnet (on the outside) and slowly bring it in contact with the first - nothing happens except the magnets stick together. Now take the same balloon and charge it (rub it on your hair). Again bring the second magnet slowly in contact and about 80-90% of the time the balloon will pop.

My initial guess is that we are creating a capacitor and when the magnets get close enough there is a discharge, but I can't prove it. Sounds like a good question for Glen? (his email isn't posted though)

Thanks.

CALENDAR

- ✦ SFE 2006, Aug. 30-31, 2006, Grenoble, France, Contact: Prof. Pierre Atten, Tel: 33 476 88 11 71 (or 73), pierre.atten@grenoble.cnrs.fr
- ✦ 28th Annual Int'l. EOS/ESD Symposium & Exhibits, Sep. 10-15, 2006, Tucson, Arizona, website: <http://www.esda.org/symposia.html>
- ✦ IEEE Conf. on Elec. Insul. & Diel. Phen., CEIDP, Oct. 15-18, 2006, Kansas City, Missouri, website: <http://www.ewh.ieee.org/soc/deil/ceidp/>
- ✦ 2006 ISEHD, 2006 Int'l. Symp. on Electrohydrodynamics, Dec. 4-6, 2006, Buenos Aires, Argentina, website: <http://www.fi.uba.ar/isehd2006/2006>
- ✦ Electrostatics 2007, 12th Int'l. Conf. on Electrostatics, IoP, Mar. 25-29, 2007, St. Catherine's College, Oxford, UK, Contact: Jasmina Bolfek-Radovani, Tel: +44 (0)20 7470 4800, jasmina.bolfek-radovani@iop.org (abstracts due by Sept. 15, 2006) website: <http://conferences.iop.org/ELE/>
- ✦ ESA 2007, June, 2007, Purdue University, West Lafayette, Indiana (more info. forthcoming)

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2007 ESA Annual Meeting
June 2007
Purdue University
West Lafayette, Indiana
(details forthcoming)