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Division of University Advancement

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ForceSpinning™ the future now underway at UTPA

Utilizing new technology developed by two engineering professors and a team of students, The University of Texas Pan-American is launching a company that could revolutionize the production of nanofibers used to manufacture a wide range of products and could help transform the Rio Grande Valley into an emerging high-tech industrial and advanced manufacturing center.

The new company, FibeRio Technology Corporation, will be headed by chairman and Chief Executive Officer Ellery R. Buchanan, an accomplished, Austin-based entrepreneur with more than 25 years experience in strategic and executive management positions in high-tech companies.
Using a new concept of ForceSpinning™ technology invented by UTPA mechanical engineering professors Drs. Karen Lozano and Kamal Sarkar, FibeRio will develop and manufacture machinery that employs centrifugal force – rather than the more costly, current electrospinning technology – to create space age nanofibers from a wider variety of materials than has never before been possible.

Jackie Michel, director of the UTPA Office of Innovation and Intellectual Property, said that by 2014 the new company plans to create about 110 jobs that pay in the range of $100,000, with even greater job creation possibilities into the future.

“UTPA faculty, students and staff have, throughout our history, contributed to the creation of a knowledge-based regional economy through the educational opportunities available to enable our graduates to become more productive citizens and to fill the work force needs of the region,” said Charles A. Sorber, UTPA interim president. “The creation of FibeRio Technology Corporation is an important example of the significantly positive impact the University has on the economy as well as the educational, cultural and social life of the Rio Grande Valley.”

UTPA Provost and Vice President for Academic Affairs Dr. Paul Sale said the company’s launch symbolizes UTPA’s commitment to research that benefits not only students but the regional economy.

“Our University is well positioned to leverage our intellectual resources to advance manufacturing and materials technologies throughout the nation and, indeed, the world,” Sale said.

“UTPA has a mission to move the results of our research into the marketplace. We share monetary returns with our faculty to encourage the disclosure of their inventions in order to maximize the benefits to the community, the University and the Board of Regents of The University Texas System,” said Dr. Wendy Lawrence-Fowler, UTPA vice provost for Research and Sponsored Projects.

James Langabeer, UTPA vice president for Business Affairs, said the creation of FibeRio should “unleash the potential for the spin-off and development of other new companies and products” that will create even more well-paying jobs throughout the Valley in the future.

At a time when universities across the country are facing increasingly difficult financial issues, the company may also prove to be a source of future revenue for UTPA, an equity holder in FibeRio.

Michel said there were two paths the University could have taken to commercialize Lozano’s and Sarkar’s ForceSpinning™ technology. It might have licensed the technology to an existing, outside company in exchange for immediate upfront cash and continuing royalties.

The other path, which the University decided was the most valuable for all of the stakeholders, was to spin-off its own company, which allows it to retain equity, providing a potentially larger source of continuing income for UTPA.

The professors who developed the technology will also be able to profit from their invention, receiving an equity position and 50 percent of the royalties received, one of the highest returns shared by any university in the nation.

FibeRio Chairman and CEO Buchanan will receive shares in the company, “sweat equity,” as his compensation, Michel said. Buchanan will put together a management team, find investors, create products from the technology and take it to market.

It is projected that between now and 2014 the new company will generate gross revenues of more than $234 million and net a total of nearly $84 million.

Michel said that although the company will initially start off with small, lab scale devices developed by Lozano and Sarkar for their research, it will move quickly to develop industrial scale machines that can produce large quantities of nanofibers.

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Numerous people, departments and agencies both inside and outside of the University have played key roles in the establishment of the new company. The seed money that professors Lozano and Sarkar needed to develop their ForceSpinning™ technology and produce a prototype of FibeRio's nanofiber fabrication device was provided late last year through a $50,000 grant from The University of Texas System's Texas Ignition Fund (TIF), a proof-of-concept grant program designed to stimulate commercialization activities at The UT System's 15 institutions.

"UTPA's successful launch of FibeRio Technology Corp. illustrates perfectly the TIF's mission to help turn research discoveries into commercial products," said Cathy Swain, The University of Texas System's assistant vice chancellor of Commercial Development. "The University's two professors were able to use TIF funds to demonstrate product reliability and to complete a business plan including market entry strategies," she said.
At that point, Michel was able to step in and "sustain the momentum by attracting a management team that brings us to this moment. We are proud to support this effort," Swain said.

To help with the startup funding FibeRio needs, the company is competing for a grant of up to $1.5 million from the Texas Emerging Technology Fund through its Rio Grande Regional Center for Innovation and Commercialization (RGRCIC), which reviews applications before sending the best to the state for possible funding. The Emerging Technology Fund was created by the state legislature in 2005 to provide money for the development and commercialization of new technologies and attracting and creating jobs in technology fields.

In addition, FibeRio is seeking venture investments to help capitalize its efforts.

Although, the launching of FibeRio is just being announced, the company has technically already been about two years in the making, beginning with professors Lozano's and Sarkar's efforts to develop a better, safer, faster and more economical means of manufacturing nanofibers. The professors were assisted in the development of their new nanofiber manufacturing technology by a team of 20 UTPA undergraduate and graduate engineering students.

"What they came up with is an elegantly simple solution to a complicated problem," Michel said, adding that "it seems like a very basic concept, but nobody had ever tried it for spinning nanofibers."

Nanofiber is a term used to describe fibers with diameters less than 0.5 microns that cannot be seen without visual amplification. They typically can be used in the manufacture of medical and filtration materials, wipes, personal care products, clothing materials, insulation, energy storage applications and even cosmetics.
The current primary technology for creating nanofibers is a process called electrospinning, which requires an electrostatic charge to elongate and whip the solution being used in the ultrafine fiber.

"Utilizing an electrostatic charge becomes very complicated because the forces are not very well understood and, therefore, are very hard to control. It also limits the range of materials you can process," Buchanan said.
Currently, the primary materials used to make nanofibers are polymers, most of which are common plastics.

"Some of the materials people really want to see in nanofibers are metals, particularly silver because of its antimicrobial properties that destroy small organisms and other metals and conductive polymers that can carry an electrical charge," Buchanan said.
The problem with trying to employ electrospinning using these materials is that "you can't hit them with an electrostatic charge because you know what happens when you put an electric charge on a metal – it electrocutes everybody," Buchanan said. That makes electrospinning a process of limited usefulness.

The ForceSpinning™ process invented by Lozano and Sarkar uses centrifugal force to push materials through minute openings to create nanofibers. Because there is no electrical charge employed in their technology, it can be used to produce nanofibers from both the materials that can and can't be used in the electrospinning process.

Michel said as part of the initial process her office undertakes in regard to intellectual property, four applications were filed in the U.S. Patent and Trademark Office to protect their original ideas.

For his part, Buchanan is looking forward to what FibeRio could eventually mean to the Rio Grande Valley.

"There is no reason that the area couldn't be a new technology center similar to the Silicon Valley in California or Research Triangle Park in North Carolina," he said.

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UTPA's new FibeRio Corporation to be led by CEO Ellery R. Buchanan

Taking on the role of FibeRio Technology Corporation's chairman and CEO will be Ellery R. Buchanan, a serial entrepreneur with 25 years of experience in top strategic and executive management positions in high technology companies, including nanotechnology.

As CEO, Buchanan, with input from the UTPA Office of Innovation and Intellectual Property, has developed a commercialization plan for the ForceSpinning™ technology and will put together FibeRio's top management team. He will also seek to raise investment capital and to find strategic partners.

An Austin, Texas resident, Buchanan was most recently with RenewData Corporation from 2004 through 2008, serving as the president and CEO of this data archiving and electronic discovery firm, where he raised millions in equity financing while improving its profitability and process quality. Prior to that, he was founder and CEO of Nanovance, a nanotechnology integration company, and chaired the first SEMI Nanoforum formed to promote commercialization of nanotech devices. Buchanan was also the executive vice president of the New Jersey Nanotechnology Consortium. In addition, he founded the Advanced Packaging and Interconnect Alliance while working from 1998-2002 as senior vice president of Marketing and Corporate Development of Ultratech Stepper, Inc., a $150 million supplier of capital equipment.

As founder, chairman of the board, CEO and president of Integrated Solutions, Inc. (ISI) from 1993-1998, he grew the manufacturer of lithography equipment for the semiconductor industry from a $20 million service-provider start-up to a $75 million multiple division enterprise with 330 employees. During this time he was named 1996 Entrepreneur of the Year by Ernst & Young. Prior to founding ISI, he served in a progression of senior management positions at GCA Corporation, a service and support business for the semiconductor industry. He began his career as a CPA with Price Waterhouse & Company and subsequently served in management at Polaroid Corporation.

Buchanan received a BA degree from Gettysburg College and an MBA from the Wharton School of the University of Pennsylvania.

Jackie Michel, director of UTPA's Office of Innovation and Intellectual Property, called Buchanan's knowledge, extensive experience and understanding of the nanotechnology market outstanding.

"Having Buchanan as CEO of this new company is a huge plus for UTPA. It validates the significance of the technology and its potential," she said.

Buchanan said the ForceSpinning™ technology of creating nanofibers will transform the materials market by providing an unlimited availability to them.

"Our specific mission within that is we want to provide the equipment and manufacturing processes to enable the production of this unlimited supply of nanofibers, which have many real life applications right now," he said.

Buchanan said there are many factors in South Texas conducive to it being a center of technology-based manufacturing and research, citing its proximity to the low cost manufacturing going on in Reynosa, Mexico and the corporate headquarters and research and development labs on this side of the border. He also noted its favorable climate, new commercial developments, and affordable housing.

"There is no reason that the South Texas region couldn't be a new technology center similar to Silicon Valley in California or Research Triangle Park in North Carolina. They need to be university-based towns and provide a supply of workforce talent, particularly engineers, and UTPA seems to recognize that need and is going down the right path providing programs to train people," he said.

Another factor that stands out about South Texas, he said, is the community support and the ability to work together across the region effectively. He noted the knowledge and leadership displayed by economic development leaders in the area and praised UTPA's Rapid Response Manufacturing Center for providing an incubation location for the start up. He has also been impressed with the technical knowledge and maturity of the students working with the faculty inventors in their labs at UTPA – all of whom could one day land in the more than 100 skilled, high-paying jobs the company will create in the next five years.

"It's not just great technology, it's not just a great business opportunity, but it's also a great learning experience for students," he said.

Buchanan said FibeRio has applied for some initial funding for the corporation of up to $1.5 million from the Texas Emerging Technology Fund through its Rio Grande Regional Center for Innovation and Commercialization (RGRCIC). The RGRCIC reviews applications before sending the best to the state to be considered for funding. Funding to make the prototype for FibeRio's nanofiber fabrication device was made possible from a $50,000 grant received late last year from The University of Texas System's Texas Ignition Fund.

FibeRio is seeking venture investments to help capitalize its efforts.

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Students have hand in UTPA invention

Saida Guerra never imagined she would have the opportunity to be involved in breakthrough engineering research as an undergraduate student at The University of Texas-Pan American in Edinburg, Texas. The 22-year-old mechanical engineering senior works as part of a research team headed by UTPA mechanical engineers Drs. Karen Lozano and Kamal Sarkar in the Department of Mechanical Engineering in the UTPA College of Engineering and Computer Science.

Guerra is among 13 dedicated UTPA engineering students who have worked on Lozano and Sarkar's invention known as ForceSpinning™. The apparatus and method, which is now being commercialized through the creation of a company – FibeRio Technology Corporation – uses centrifugal force to manufacture nanofibers in larger quantities and at a lower cost.

As a volunteer student researcher on the project since 2007, Guerra feels the experience she has gained has been invaluable and will help her upon entering the work force.

"I think the chance to do research as an undergraduate is very useful and one of the advantages to studying at UTPA. I never imagined the career possibilities and variety that an engineering degree offered until working on this project," Guerra said. "You learn so much more by doing hands-on work. This opportunity has allowed me to take the theoretical knowledge I learn in the classroom and apply it to real-world situations. When I start to interview with companies, I'm going to be able to show that I have experience."

She said being a part of a project this large has helped her to mature personally and professionally.

"I feel like I've learned more from this project than any class could have taught me. It's allowed me to develop my creativity in problem solving and has also developed my communication and presentation skills," Guerra said. "It's taught me such a great deal of responsibility too because you have to work independently and so many people depend on your contributions."

Lozano said it's important for students to have opportunities to do research because it not only gives them experience working, but it allows them to learn from their mistakes.

"Working in situations like this gives them the opportunity to fail. Research involves lots of failure, which is important, because that's how we learn," Lozano said. "If something goes right on the first attempt, we do not ask many questions. It's the questions which allow us to learn the system."

She said projects such as these allow students with different learning styles to grow and develop their creativity, which will make them more attractive to employers.

"Hands-on learning enhances knowledge retention," Lozano said. "It also gives them invaluable experience that helps them in their interviewing process. Since they worked on a state-of-the-art project they can talk about that information in their interviews, which makes for interesting conversation and provides them with a competitive advantage."

Harlingen native Steve Zambrano, a junior majoring in mechanical engineering who is also working on the ForceSpinning™ invention, has been interested in engineering since he was a boy.

"When I was smaller I would always take things apart and try to put them back together. I've always had an interest in how things functioned and how electronics worked," Zambrano said. "But what really encouraged me to pursue a program of study in engineering was when I realized how much engineers are needed in everyday life."

Zambrano has worked on improving the design of the apparatus and methods for over a year and is amazed by the growth of the project.

"There's so much that I've learned on the job that I never dreamed I could learn in the classroom," Zambrano said. "When we began this project, I never thought that we'd take it this far in this short amount of time."

He said he is happy about the implications the company will have not only for students and future graduates, but for the area.

"I'm so grateful for this project for not only the opportunities it will bring me, but how it will affect the entire Rio Grande Valley community," he said. "There are so many applications for what this machine can do. It will create so many jobs and will also bring recognition to the area."

Sarkar is excited to be able to help his students not only through teaching and research, but by creating jobs for them.

"This company will open up opportunities for students in their careers," Sarkar said. "Students need not travel far and leave their loved ones behind as I had to do. Valley people can now dream to live their professional lives right here in the Valley and make their mark. It'll be up to them to make it the 'Nanotechnology Valley' like the Silicon Valley of our country."

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Guerra said she is looking forward to the future of the company that will soon be operational in the area.

"To pursue a career in engineering, most people have to move away to other states," she said. "I'm really hoping that the company will offer me an opportunity to fulfill a career here close to my roots."

Both Guerra and Zambrano are planning to continue their education upon graduation from UTPA and pursue master's degrees in the field of biomedical engineering – an area that focuses on developing medical necessities such as prosthetic limbs and artificial hearts to improving tissue regeneration and artificial skin grafting.

"I know that I am very well prepared for graduate school after working on this project," Guerra said. "We've been expected to work as if we were graduate students, so I think when I make the transition to graduate school, it's going to be so much simpler."

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UTPA invention chosen for World's Best Technologies Showcase in March 2010

EDINBURG, Texas – The University of Texas-Pan American is spinning out a new and undiscovered technology – known as ForceSpinning™ – that will manufacture nanofibers in larger quantities and at a lower cost.

Invented by Dr. Karen Lozano and Dr. Kamal Sarkar, faculty in the Department of Mechanical Engineering in the UTPA School of Engineering and Computer Science, the cutting-edge and disruptive technology was pre-selected as one of 10 "Early Pick" presenters for the 2010 World's Best Technologies (WBT) showcase. The showcase is the nation's premier event exhibiting the largest collection of undiscovered technologies coming from the world's leading universities, labs and research institutions.

"It is an honor (to be chosen to present), but at the same time it is a great responsibility to be a trailblazer because we want this to be the first time out of many to come for other UTPA professors," Lozano said.

Lozano and Sarkar, who have been collaborating on the ForceSpinning™ method for more than four years, developed the patented technology that uses centrifugal force to manufacture nanofibers out of a vast range of materials in a safe mode and at a fraction of the cost of the traditional process, which are either interfacial polymerization or electrospinning and are lengthy and costly.

"It means a lot to me (to be chosen) to do something for my students beyond teaching and doing research," Sarkar said. "I'll be able to open up opportunities for their lives and careers."

Both Lozano and Sarkar said their invention was chosen as an "Early Pick" because of the vast and important potential applications – filtration, biomedical, energy, structural, smart textiles – of nanofibers their technology can create. Lozano said UTPA's technology is the only "Early Pick" representing Texas.

The WBTshowcase, which will be held March 16-17, 2010 in Arlington, Texas, will offer 10 pre-selected standout companies and research institutions the opportunity to present their technologies to more than 100 seasoned venture investors and Fortune 500 licensing scouts representing a variety of industries looking to invest in new technologies.

"Our early pool of submissions offer a peek at the quality and level of deal flow created from the enormous investment in research and development funding both nationally and regionally. At the same time, we are witnessing emerging and converging companies and solutions that no longer fit neatly within a single industry category. It's an exciting time for investors and licensees alike," said Paul Huleatt, WBTshowcase CEO, in a press release published by the organization.

UTPA joins a select group of presenters representing world-class companies and universities including technologies developed or supported by MIT, U.S. Navy, Cornell, National Science Foundation, University of Arkansas, National Institutes of Health, and seed and venture capital funds.

"The selected presenters represent innovation at its finest, with submissions originating from around the country and the world and we are very pleased our technology has been selected to join this group and to present at the 2010 WBTshowcase," said Jackie Michel, UTPA's Innovation and Intellectual Property director. "The visibility for UTPA research and the results seen through pursuing our vision as a 'learner-centered research institution' will be showcased at this event."

Michel said one in three of past presenters have been successful in raising over $450 million in funding, which is significant for UTPA right now as it embarks on establishing its first company – FibeRio Technology Corporation. The start-up company is expected to develop and supply proprietary equipment for the fabrication of nanofibers with the potential to create unique nanofiber materials that cannot be produced using other methods.

"Not only is this a new technology, we believe it to be a 'disruptive technology' that breaks the barriers of existing technology and creates new opportunities by finding new applications and materials that are not possible with existing technologies," Sarkar said. "I believe that our technology will break two major barriers of nanotechnology, namely, cost and productivity. If things go the way we envision, the cost of nanofibers will come down to a fraction of present cost to tens of dollars compared to hundreds of dollars for a gram of nanofibers. Productivity will also go up to hundreds of pounds a month, rather than a few pounds a year."

Lozano will be making a six-minute presentation at the 2010 WBTshowcase with Kial C. Gramley, UTPA market research analyst at the UTPA's Office of Innovation and Intellectual Property. Lozano and Gramley will be coached and prepped by mentor teams made up of seasoned experts to make a concise, investor-oriented presentation. All presenters are eligible for the honor of "World's Best Technology" where investors and licensing scouts ultimately select the top three most promising technologies, designating one to receive the "Best of Show" award.

"It is a different scenario for me now. I have a passion for research and discovery and I feel confident in my lab, now I am learning about the management world, which is needed to transfer the technology to the society. As an engineer I think this is one of our ultimate goals, to develop technologies to benefit the society," Lozano said.

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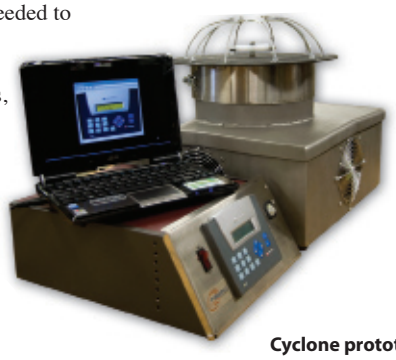

Cyclone prototype

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Sarkar Explains the World of Nanofiber Technology

What is nanotechnology?

Nanotechnology, also nanoscience, is the science, art, and technology of making, understanding, and applying nanomaterials. Nanomaterial is any material that has at least one dimension that is. One micrometer or micron is one millionth of a meter. Our hairs are typically 50 microns. Smallest dimension we can see is only 10 microns. We can not see anything smaller than this dimension. Nanometer is a one billionth of a meter. In other words, 50 nanometers is one thousandth of your hair. Talk about splitting the hair! In nanotechnology we talk about this type of dimension. Diameters of nanofibers are typically between 100 to 500 nanometers.

What's the big deal about nanofibers?

The biggest advantage of nanofibers are their small dimension, i.e. diameter. This tiny dimension means less defects and hence stronger, tougher and better materials. Also this tiny diameter means thousands of times larger surface area compared to its own bulk cousins. As a result, any property, chemical or physical, that depends on surface area is dramatically enhanced. For Example, if it takes days for a certain size sugar crystal to dissolve, it will take only minutes to dissolve the same crystal if we can break the crystal into tiny sugar nanoparticles. This is a critical property we are planning to exploit to develop next generation drug delivery devices that will have significantly lower side effects such as no hair loss for cancer drugs.

What's electrospinng?

Electrospinning is the most popular method to make nanofibers from a limited class (typically non-conductive that can be dissolved in a non-conductive solvent) of polymers. In this method a dielectric (that means non-conductive) polymer solution is forced through a high electric field (10,000 – 30,000 volts) by pushing the solution through a sub-millimeter size nozzle. This results in polymeric nanofibers. Limitations of the typical electrospinning process include safety (high electric field), material (non-conductive polymer and no metal), productivity (low yield), and cost (commercial systems cost $100,000 and more), to name a few. Electrospinnng can only perform solution spinning because it needs a solution to start with.

What's ForceSpinningTM?

In this UTPA patent pending technology we use centrifugal (not high voltage electrical) force to make nanofibers. We can use either solution or melt spinning. There are no significant limitations in materials and consequently we can make nanofibers from either solid material or solutions that include metals, polymers (both conductive and non-conductive), ceramics, composites, etc. Unlike the electrospinning process, we can use solid materials and melt them to make nanofibers. In electrospinning you must have a solution to start with (thus the difference between solution- and melt spinning. If you can not make a solution, you ca not make nanofibers for those materials.

Since there is no high voltage involved, it is safe. Safety has been further augmented by making our design amenable inside standard chemical hoods.

Flexibility is another important feature of the proposed technology. In electrospinning it takes a long time (more than an hour) to switch materials, if it can even be done. Using Forcespinning™ it is easy, simple, and takes less than 15 minutes to switch to the next material. This is a significant advantage in materials research.

Productivity and yield are significantly higher for ForceSpinningTM compared to typical electrospinning and our cost of the equipment is a fraction of that of electrospinning.

Because of these advantages we believe that ForceSpinningTM will effectively take over electrospinning both as a choice of equipment and choice of making nanofibers for a large array of materials, not possible by electrospinning. Finally, high volume and a dramatic drop in cost of nanofibers will develop many new commercial applications that are not possible now. These are the reasons we believe that ForceSpinningTM is truly a "disruptive technology."

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