

Small details, great expectations: Oklahoma leads the way in nanotechnology

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OKLAHOMA CITY – For a person whose life revolves around the minutia of nanotechnology, Jim Mason sees the big picture for its future in Oklahoma.

Mason, executive director of the Oklahoma Nanotechnology Initiative, a program of The State Chamber of Oklahoma, is dedicated to connecting companies with the nanotechnology that can help them create better products. The initiative is about to go into its fourth year of funding Oklahoma companies with \$1.5 million allocated by the Legislature.

Nanotechnology is the use of atoms and molecules at the 1-to-100-nanometer scale to create new or improved products, in areas ranging from medical to aerospace to electrical. For perspective, a nanometer equals one-billionth of a meter. A meter is about 39 inches long.

“I really believe nanotechnology is the future,” Mason said. “We’ve been through the Industrial Age, the Information Age and the Computer Age. I think the next 50 years will be the age of nanotechnology.”

Nanotechnology in Oklahoma

Oklahoma was the first state to write a law with financial incentives for companies wanting to bring new products to market using nanotechnology. Since funding began, the initiative has given money to 12 companies, but 50 companies are using nanotechnology in some way, Mason said.

Other states are focusing more of their efforts on research, and although Oklahoma does its own share of research, Mason said, his focus is on bringing products to market.

“We realized that for our state to get ahead and to help our economy, we have to help our companies find better ways to make their products,” he said. “We wrote the incentive so that it doesn’t matter where the technology is coming from as long as an Oklahoma company is taking advantage of it. They may use the money to license a product or acquire a patent or whatever needs to be done.”

Applications for the next round of funding begin in February with workshops, followed by proposals coming due in April and the funding dispersed in May or June. Companies can apply for a proof-of-concept grant of up to \$45,000 or an accelerated grant, which means they’re ready to bring a product to market, of \$50,000 to \$500,000.

Nanotechnology potential

Phononic Devices Inc., whose research is being conducted at the University of Oklahoma in Norman, is poised to bring its nanotechnology materials to bear in the world of electricity. Dr. Patrick McCann, co-founder and chief technology officer at Phononic Devices, said the company’s work is about converting heat to electricity – a tremendously untapped area worth \$125 billion.

“For example, at a factory where a lot of heat is generated, it would be possible to put a device on the hot portions of whatever exists there and capture the energy from the heat and convert it to electricity,” McCann said. “It’s a huge opportunity. More than one-half of the energy wasted as heat is not being captured. If we can capture even 5, 10 or 15 percent more of that energy, we can pipe it back into the grid. You won’t need new power lines and we’ll be more efficient.”

The concept – using Phononic’s thermoelectric materials – also works in reverse by cooling objects, McCann said. The approach will be more cost-effective than using compressors and will have new localized applications in homes and office buildings.

McCann said Phononic Devices should have a proof-of-concept prototype within two years. Last month, the company received a \$3 million grant from the Department of Energy to continue its work. When the work comes to fruition, the challenge will be keeping the company in Oklahoma and finding trained people to go to work.

“If we’re successful and prove the scientific concept the way we think we can, then it can grow very fast,” said McCann, who also is an OU professor. “The company may need to hire 300 people in an eight-month time period. The problem is that those 300 people need to be highly trained. The keys to that are our universities.”

Future of nanotechnology

In 2010, Mason said he plans to continue serving as a nanotechnology “matchmaker” – asking companies about the problems they’ve not been able to solve with their products, then seeing if nanotechnology can provide a solution.

Nanotechnology training programs also are getting under way in Oklahoma, he said. The Institute of Technology in Okmulgee has begun a two-year training program in nanotechnology instrument certification. Tulsa Community College has a similar program in nanotechnology electronics, and a program is being developed in nanotechnology and microtechnology at Oklahoma City Community College, he said. “We think these are the jobs of the future,” he said.

Also on the horizon is a nanotechnology incubator – a place where companies can try out nanotechnology on their products before making a big financial commitment, Mason said.

State making significant strides with products

OKLAHOMA CITY – In today’s world marketplace, an estimated \$500 billion in products use nanotechnology. In the next five years, that number is expected to reach \$3 trillion.

And Jim Mason expects Oklahoma to be responsible for a big part of that.

Mason, executive director of the Oklahoma Nanotechnology Initiative, said early areas of success in nanotechnology will be in electrical, chemical, manufacturing, pharmaceutical and aerospace. Eventually, medicine will become dominant, once safety and efficacy are proved, he said.

Oklahoma already has made significant strides with nanotechnology products. Here’s a sampling:

- SouthWest NanoTechnologies in Norman manufactures carbon nanotubes, which are becoming the basic building block for nanotechnology, Mason said. In a project with Boeing, scientists are creating the world’s smallest electrical nanocable to be used on aircraft, Mason said. Carbon nanotubes conduct electricity better than copper, aluminum or any other substance, he said, and they weigh less. Initial use on an aircraft will be as sensors on the wings to detect things going on with the plane. “They project that within the next year, they will have several million dollars of nanocables on the market, and they’re using carbon nanotubes made by SouthWest NanoTechnologies,” Mason said.
- Rupture Pin Technologies in Oklahoma City, which makes pressure relief valves for the oil and gas industry, uses nanotechnology to strengthen its O-rings, Mason said. Using carbon nanotubes – which are 100 times stronger than steel but still flexible – the O-rings are strengthened. Mason said this solved the problem of the O-rings sometimes blowing out before the pressure relief mechanism could activate.

- Access Optics in Broken Arrow, which makes lenses for endoscopes used by proctologists, uses nanotechnology to solve a problem with the devices. Because the instruments must be cleaned thoroughly in a high-pressure, high-heat autoclave, sometimes the glass-to-metal seal would break down after several cleanings. But with a coating that employs nanotechnology, that problem was eliminated. “They’re the only lense maker in the world that has solved that problem,” Mason said.

- Oklahoma is the only place in the country where non-military creators of unmanned aerial vehicles (UAVs) – a remotely controlled plane that features nanotechnology – can test fly them up to 40,000 feet. One pieces of airspace is near Lawton and Fort Sill; another is in Ponca City. In other states, civilian UAV creators are restricted to model airplane airspace and a height of about 100 feet, Mason said. Only approved Department of Defense contractors can fly UAVs in military airspace. “We are getting a lot of interest from companies wanting to locate their businesses near here because they can test fly their products,” he said. “There are a lot of applications for nanotechnology in the military arena. Right now, there are up to 25 UAVs flying in Afghanistan, helping us see things we couldn’t see before.”