# Building Better Batteries: Penn State Researcher Has A New Idea!

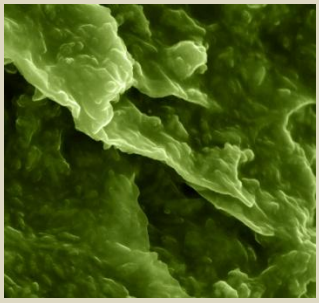
The basic physics of an electric battery haven't really changed all that much in more than century. It uses the movement of positive and negative ions to store an electrical charge, and it eventually wears out and needs to be replaced.

But what would happen, say, if a battery could hold a charge for an exponentially longer period of time. Not only that, but the charge it held could be more stable, more reliable, and more dependable.

And the best part? The technology that makes it all possible has a really cool collegiate name, as in the "Li-Ion" battery, developed at Penn State University, home of the Nittany Lions.

Led by Dr. Donghai Wang, the Penn State concept works at the atomic level to create a highly conductive surface area. This nanocomposite, which uses less carbon than typical battery technology, is as a result more conducive to high electronic activity. This makes it very well-suited for applications in supercapacitors, and for the end-user market of high-performance batteries. Wang's project has received financial and operational support from the Pennsylvania NanoMaterials Commercialization Center.

"The pre-commercialization project we're funding supports Dr. Wang and his researchers at Penn State to develop and commercialize an advanced graphene-based nanocomposite for electrochemical energy storage applications, such as the Li-Ion battery and supercapacitors," explained Alan Brown, executive director of the Center.



"The novel graphene-based nanocomposite will have high energy density and/or high power in the energy storage devices and it can also significantly improve electrode kinetic and cycling stability for energy storage techniques," Brown said. "The team's previous successful experiences in technology commercialization will help accelerating the commercialization of graphene-based nanocomposite for electrochemical energy storage dramatically."

"Now, users must change batteries many times over many years," said Dr. Wang. "This technology offers improved stability, and can penetrate the high-performance battery market. We are moving toward commercialization, and the pre-commercialization project being conducted with the help of the Center is helping us to optimize completion of the technology's structure and performance. What's also needed for successful commercialization is to find ways to lower the cost of implementing and using this technology.

"The Center is supporting us with funding for research, materials, testing and optimization," Wang continued. "The Center also is giving us regular feedback and suggestions as we look at commercialization. They have provided valuable market research and analysis. It's a very good interface between academia and the marketplace.

The Center also attracts funding from the U.S. Air Force Research Lab, opening doors to multiple government agencies and defense applications."

Wang has been working on this particular technology for more than three years, and the journey has been one of continuous discovery and advancement.

"Originally we had the basic nanotech concept, then discovered it could be used very well as battery materials," he recalled. "But as we worked with the technology in more detail, we then discovered its supercapacitor applications. Because we have received great feedback along the way, through working on this project, I've been able to pursue different angles to the work, other ways to think about approaches to move forward and to lower costs. It has been a very rewarding process."

Supported by a single undergraduate student and with access to graduate students as needed at Penn State, Wang voiced confidence that the Li-Ion battery technology has great potential to meet a need in the marketplace. Ongoing assistance from the Center will continue to play an important role in that evolution, as well, he said.

"The Center has been very efficient," he noted. "They work closely with the university and work very hard to give us constructive feedback."