

Research may crystallize in more powerful batteries

By HUI CHIN LIM
Staff Reporter

Even the coldest Nebraska winters could be powerless to weaken car batteries, thanks to some UNL physics researchers.

Led by Stephen Ducharme, the researchers are working to create a cold-proof electric storage device called a capacitor.

"The device called the capacitor is better than a battery in the sense that it works even in cold temperature," said Ducharme, an associate physics and astronomy professor.

A capacitor will be possible when UNL researchers finish developing the perfect crystal in a joint effort with researchers from the Institute of Crystallography in Moscow's Russian Academy of Sciences.

Such a perfect crystal, defined by its ultra-thinness, could lead to many significant innovations.

The crystalline structure being studied to create the perfect crystal consists of single-layered polymer films and is the result of five years of collaborative research between American and Russian physicists.

This polymer material has existed for about 30 years, but research remains in early stages. Many engineering questions have yet to be answered.

Ducharme said he discovered the crystal project partly by accident about three years ago while working on another project.

He started developing the idea of an ultra-thin polymer film after meeting with Russian colleagues Vladimir Fradkin and Alexander Bune five years ago.

Although the car capacitor seems most promising, it's not the only advancement possible should the colleagues' breakthrough polymer research succeed.

Ducharme said the polymer also is extremely useful for information storage, because it is a lot faster to retrieve information from it than crystalline systems being used now.

Batteries also could become more efficient.

"The electrical storage capacity of batteries and capacitors depends on the surface area and thinness of materials," Ducharme said.

Thinner materials would allow the manufacture of lighter-weight batteries and other energy storage devices.

According to Ducharme's theory, if the polymer film could be made 10 times thinner, it would produce 100 times more energy.

Should he finish creating the perfect crystal, it wouldn't be Ducharme's first patented success.

His most prominent is a patent on an optical device-called an ellipsometer that tests material surfaces.

The device, created in collaboration with the J.A. Woollam Company in Lincoln, was a university project with NASA to invent an instrument to study the degradation of surface materials for shuttles in space.

UNL senior physics major Shawn Peibly said Ducharme's intensity keeps everyone on his research team focused and motivated to find the perfect crystal.

"Professor Ducharme is very dedicated to his job, and this makes him a success."

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