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Engineer's findings to help hybrid, Electric Cars keep their cool

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Technology.am (Sept. 23, 2009) — Purdue University researchers have determined how fluid boils in tiny "microchannels" creating formulas and models that will help engineers design systems to cool high-power electronics in electric and hybrid cars, aircraft, computers, and other devices.
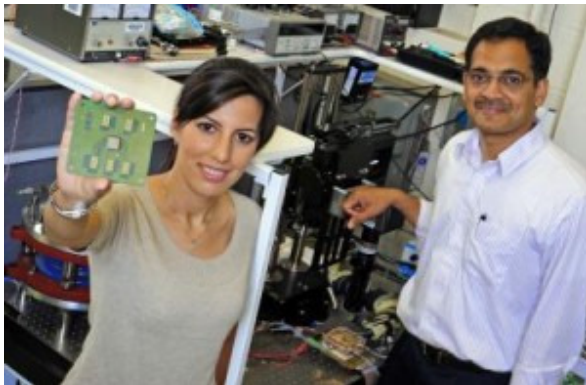
Indiana's 21st Century Research and Technology Fund has provided $1.9 million to Purdue and Delphi Corp. in Kokomo, Ind., to help commercialize the advanced cooling system using microchannels for electronic components in hybrid and electric cars.

The new type of cooling system will be used to prevent overheating of devices called insulated gate bipolar transistors, high-power switching transistors used in hybrid and electric vehicles.

The chips are required to drive electric motors, switching large amounts of power from the battery pack to electrical coils needed to accelerate a vehicle from zero to 60 mph in 10 seconds or less.

The researchers studied a "dielectric liquid," a fluid that doesn't conduct electricity, which allows it to be used directly in circuits without causing electrical shorts.

"We have finally made sense of boiling in small-scale channels and now have a nice understanding of the physics," said Garimella, director of the NSF Cooling Technologies Research Center.

Researchers used special test chips fabricated by Delphi that are about a half-inch on each side and contain 25 temperature sensors.

"Right under each of these sensors is a little heater, so we can adjust the amount of heat we apply to specific locations on the

chip and simulate what happens in a real chip," he said.

Too much heat hinders the performance of electronic chips or damages the tiny circuitry, especially in small "hot spots."

"In order to design these systems properly you need to be able to predict the heat-transfer rate and how much cooling you will get," he said.

The microchannels are etched directly on top of the silicon chips. Because both the channels and the chip are made of silicon, there is no dramatic difference in expansion from heating, which allows chips to be stacked on top of each other with the cooling channels between each chip.

They developed formulas that allow engineers to tell when different kinds of flows occur and how to design the systems accordingly.

The cooling systems also are being developed to cool the electronic controls in aircraft, military systems and for other applications.

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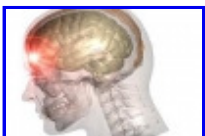[23 Feb 2011 | Comments Off | 0 views]
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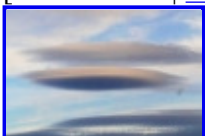[Spotify Closes In On Universal Deal, US Launch [Unconfirmed]](#)
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