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### Carbon Nanotubes Are Superior To Metals For Electronics, According to Engineers

Just In:

*ScienceDaily* (Mar. 24, 2009) — In the quest to pack ever-smaller electronic devices more densely with integrated circuits, nanotechnology researchers keep running up against some unpleasant truths: higher current density induces electromigration and thermomigration, phenomena that damage metal conductors and produce heat, which leads to premature failure of devices.

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metals."

Single Walled Carbon Nanotubes are extremely thin, hollow cylinders, measuring no thicker than a single atom. Thousands of times stronger than metals, they are expected to one day replace metals in millions of electronic applications.

Basaran and his doctoral student Tarek Ragab have spent the past four years performing quantum mechanics calculations, which prove that in carbon nanotubes, higher current density does not lead to electromigration and thermomigration; it also produces just one percent of the heat produced by traditional metals, such as copper.

Basaran will present the findings in November when he delivers a keynote lecture at the American Society of Mechanical Engineers (ASME) International Mechanical Engineering Congress and Exposition in Orlando.

But University at Buffalo researchers who study electronics packaging recently made a pleasant discovery: that's not the case with Single-Walled Carbon Nanotubes (SWCNTs).

"Years ago, everyone thought that the problem of cooling for electronics could be solved," said Cemal Basaran, Ph.D., professor in the UB Department of Civil, Structural and Environmental Engineering and director of the Electronics Packaging Lab in UB's School of Engineering and Applied Sciences. "Now we know that's not true. Electronics based on metals have hit a wall. We are done with



Research conducted by Cemal Basaran may make metal an obsolete component of electronics. (Credit: Image courtesy of University at Buffalo)

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nanotube-based electronics become a reality, U.S. electronics manufacturers may be in a position similar to U.S. car manufacturers today, because they have failed to keep up with advances in engineering," he said.

nanotubes on [nanoporous plastic surfaces](#). The method, which is described in ... > [read more](#)

Adapted from materials provided by [University at Buffalo](#).

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