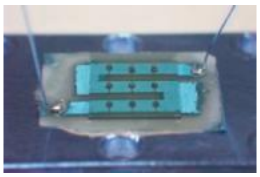
ScienceNews
MAGAZINE OF THE SOCIETY FOR SCIENCE & THE PUBLIC
http://www.sciencenews.org/view/generic/id/3742

A NEW COOL: PROTOTYPE CHILLS FAST AND ELECTRIFIES, TOO

By Jessica Gorman

April 5th, 2003; Vol.163 #14 (p. 213)



Enlarge

COOL GADGET. A prototype, the size of a postage stamp, relies on thin layers of semiconductors to power small fans and cool steel.
M. Mantini/RTI International

Researchers last week rolled out a prototype semiconductor-based device that stands a good chance of transforming some refrigeration and power technologies. Made of thousands of alternating atoms-thick layers of two semiconductor materials, the so-called thermoelectric structure can pump heat when powered by electricity or, conversely, turn a temperature difference into electric current.

For 40 years, scientists have envisioned thermoelectric materials as quiet, reliable, and energy-efficient components for cooling devices such as refrigerators, says Rama Venkatasubramanian of the Research Triangle Institute (RTI) in Research Triangle Park, N.C. In reality, thermoelectrics have been too inefficient and expensive to do much more than cool beverages in picnic baskets or power deep-space probes that need especially reliable components (SN: 9/6/97, p. 152: http://www.sciencenews.org/sn_arc97/9_6_97/bob1.htm).

Then, 18 months ago, Venkatasubramanian and his colleagues reported a new thermoelectric material that greatly surpassed the efficiency of previous materials (SN: 11/3/2001, p. 280: Available to subscribers at http://www.sciencenews.org /20011103/note11.asp). Last fall, another research group reported yet another thermoelectric material that also passed that milestone.

At a meeting of the American Chemical Society in New Orleans on March 27, Venkatasubramanian reported that he and his RTI colleagues have incorporated their material into a prototype device that performs as well as conventional thermoelectric-based coolers, yet is far smaller and quicker to chill. The team has used the device as a power source to run four small fans. To show its chilling abilities, they cooled a small block of steel 15�F in 2 minutes.

Venkatasubramanian and his colleagues must have solved some challenging engineering problems to make the prototype, says mechanical engineer Gang Chen of the Massachusetts Institute of Technology, who hasn't yet seen the device. The work is "very encouraging," he says.

With another 6 months of development, Venkatasubramanian expects the device's efficiency to double. Initial applications would be high-end ones, such as spot cooling of lasers in communications networks, he says. Eventually, thermoelectric components might power cell phones by taking advantage of a person's body heat. In other designs, Venkatasubramanian suggests, the materials might quickly cool cans of soda in a vending machine shortly before they're dispensed instead of relying on energy-consuming, perpetual refrigeration.

It's difficult to minimize heat and electricity losses when creating a working device, says Cronin B. Vining, president of the thermoelectric consulting company ZT Services in Auburn, Ala. If in just a year and a half, the researchers have made a prototype that performs in the ballpark of commercial devices, says Vining, "that's serious progress."

****

If you have a comment on this article that you would like considered for publication in *Science News*, send it to editors@sciencenews.org. Please include your name and location.