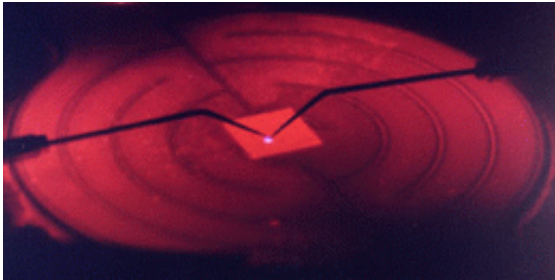


# Researchers Extend Life of Hot Temperature Electronic Chip

September 11 2007

---



The circular heating element and 5 x 5 mm square SiC chip are both glowing red-hot. The diode being tested electroluminesces blue light when forward biased. SiC devices have repeatedly demonstrated proper operation at temperatures as high as 650 C. Silicon-based semiconductor electronics cannot function at these temperatures. Image credit: NASA

NASA researchers have designed and built a new circuit chip that can take the heat like never before.

In the past, integrated circuit chips could not withstand more than a few hours of high temperatures before degrading or failing. This chip exceeded 1,700 hours of continuous operation at 500 degrees Celsius - a breakthrough that represents a 100-fold increase in what has previously been achieved. The new silicon carbide differential amplifier integrated circuit chip may provide benefits to anything requiring long-lasting electronic circuits in very hot environments.

Such highly durable integrated circuitry and packaging are being developed to enable extremely functional but physically small circuitry for hot sections of jet engines. In the future, such electronics will enhance sensing and control of the combustion process that could lead to improved safety and fuel efficiency as well as reduced emissions from jet engines.

Similar benefits are also possible for automotive engines. Additional potential benefits of long-lasting high temperature integrated circuitry extend to oil and natural gas well drilling and anything requiring long lasting electronic circuits in very hot environments, including robotic exploration on the hostile surface environment of Venus.

"It's really a significant step toward mission-enabling harsh environment electronics," said Phil Neudeck, an electronics engineer and team lead for this work by the Aeronautics Research Mission Directorate at NASA's Glenn Research Center in Cleveland. "This new capability can eliminate the additional plumbing, wires, weight and other performance penalties required to liquid-cool traditional sensors and electronics near the hot combustion chamber, or the need to remotely locate them elsewhere where they aren't as effective."

This successful project is a combined effort of the Aviation Safety and Fundamental Aeronautics programs under NASA's Aeronautics Research Mission Directorate. For more information, visit: [www.grc.nasa.gov/WWW/SiC](http://www.grc.nasa.gov/WWW/SiC)

Source: NASA

Citation: Researchers Extend Life of Hot Temperature Electronic Chip (2007, September 11) retrieved 9 April 2024 from

<https://phys.org/news/2007-09-life-hot-temperature-electronic-chip.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.