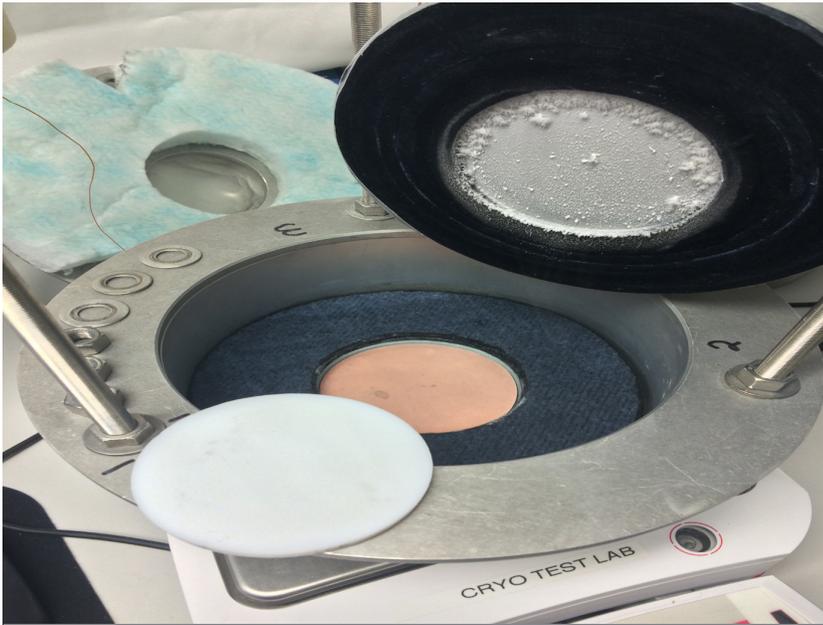




TECHNOLOGY SOLUTION

Instrumentation



Macroflash (Cup Cryostat)

A compact instrument to measure thermal conductivity of materials at below-ambient temperatures

NASA Kennedy Space Center seeks partners interested in a practical method for measuring thermal performance of materials at below-ambient temperatures or subjected to a large temperature difference. The technology uses liquid nitrogen as a direct heat energy meter and is applicable to testing at a wide range of temperatures from 373 K down to 77 K and under an ambient pressure environment.

The Macroflash follows the guidelines of the newly established technical standard ASTM C1774 (Annex A4) and provides a cost-effective, field-representative methodology to test any material for below-ambient temperature applications. From engineered systems to research testing to quality control in manufacturing, the technology provides utility for the fields of energy, transportation, construction, and environment.

BENEFITS

- Compact and easy to use
- Cost-effective compared to commercially available thermal test instruments
- Convenient size for test specimens (solids, foams, or powders)
- Multiple tests can be completed in one day
- No costly vacuum chamber set-up required
- Provides thermal conductivity data for below-ambient temperatures and under more realistic conditions of a large temperature difference



THE TECHNOLOGY

Advances in new polymers and composites along with growing industrial needs in below-ambient temperature applications have brought about the Macroflash development. Accurate thermal performance information, including effective thermal conductivity data, are needed under relevant end-use conditions. The Macroflash is a practical tool for basic testing of common materials or research evaluation of advanced materials/systems.

The Macroflash can test solids, foams, or powders that are homogeneous or layered in composition. Test specimens are typically 75mm in diameter and 6mm in thickness. The cold side is maintained by liquid nitrogen at 77 K while a heater disk maintains a steady warm-side temperature from ambient up to 373 K. The steady boiloff of the liquid nitrogen provides a direct measure of the heat energy transferred through the thickness of the test specimen. Nitrogen or other gas is supplied to the instrument to establish a stable, moisture-free, ambient pressure environment. Different compression loading levels can also be conveniently applied to the test specimen as needed for accurate, field-representative thermal performance data. The Macroflash is calibrated from approximately 10 mW/m-K to 800 mW/m-K using well-characterized materials.



Back image for Macroflash TOPS

APPLICATIONS

The technology has several potential applications:

- Electrical power and energy storage
- Refrigeration and cryogenics
- Aerospace and advanced materials
- Construction materials
- Ground and air transportation

PUBLICATIONS

Patent No: 10,656,109

More Information

National Aeronautics and Space Administration
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NP-2015-02-1322-HQ

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KSC-13916, KSC-TOPS-22