High Thermal Conductivity Boron Arsenide For Thermal Management, Electronics, And Photonics Applications

Tech ID: 30201 / UC Case 2018-468-0

SUMMARY

UCLA researchers in the Department of Mechanical & Aerospace Engineering have developed a novel boron arsenide (BAs) material that has an ultra-high thermal conductivity of 1300 W/mK and low cost of synthesis and processing.

BACKGROUND

Thermal management in electronics is one of the industry's major technical challenges. As the temperature of electronic devices increase, their performance is impaired significantly. Heat-management materials currently in use have limited thermal conductivity, e.g. 35 W/mK for aluminum oxide (Al2O3) and 300 W/mK for silicon carbide (SiC). Diamond is considered the best thermal conductor (κ~2000 W/mK) but is cost-prohibitive for widespread use. There is an urgent need for materials with ultrahigh thermal conductivity (over 1000 W/mK) but with low cost for efficient heat management

INNOVATION

UCLA researchers in the Department of Mechanical & Aerospace Engineering have developed a novel boron arsenide (BAs) material with ultrahigh thermal conductivity. BAs crystal of high quality was measured to have a thermal conductivity of 1300 W/mK, 2 times higher than boron nitride and 10 times higher than silicon, making BAs the best thermal conductor among any bulk semiconducting or metal material. Moreover, the low cost of material synthesis and processing makes BAs ideal for heat management in electronics and photonics devices.

APPLICATIONS

- Electronics
- Photonics
- Optoelectronics
- Acoustic devices

ADVANTAGES

- High quality crystals
- Ultrahigh thermal conductivity
- Low synthesis cost
- Low processing cost

STATE OF DEVELOPMENT

Material performance demonstrated in the lab.

RELATED MATERIALS

- Kang, Joon Sang, Man Li, Huan Wu, Huuduy Nguyen, and Yongjie Hu. "Experimental observation of high thermal conductivity in boron arsenide." Science 361, no. 6402 (2018): 575-578.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,948,858	04/02/2024	2018-468

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INVENTORS

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OTHER INFORMATION

KEYWORDS

thermal managing, thermal conductor, materials, conductivity, overheating, cooling, heat dissipation, boron arsenide, crystal

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Computer**
  - Hardware
- **Engineering**
  - Engineering
- **Materials & Chemicals**
  - Electronics Packaging
- **Semiconductors**
  - Materials

RELATED CASES

2018-468-0

Additional Patent Pending

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