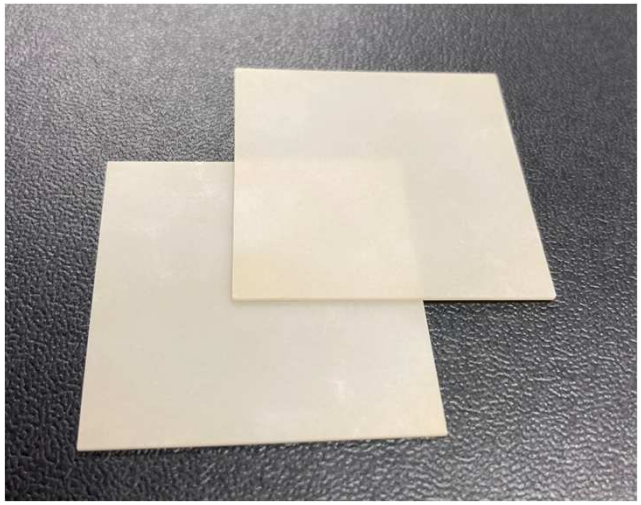
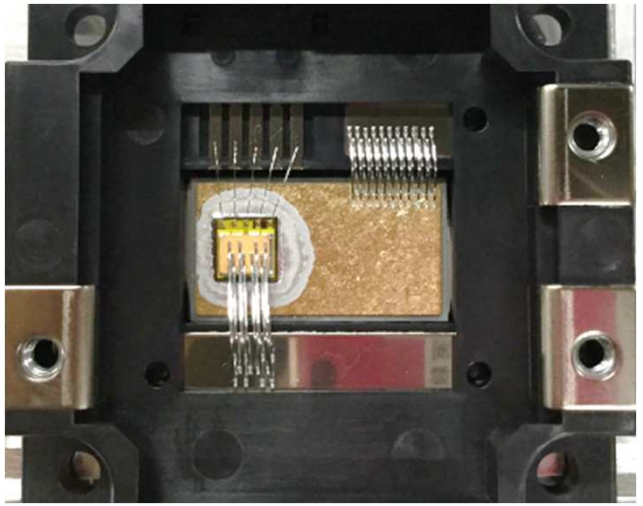


U-MAP Co., LTD.
Ultimate Material and Processing



ThermalNite added AlN substrate
with both high thermal conductivity and high fracture toughness

Company

A materials start-up company from Nagoya University with cutting-edge technology in heat-dissipating materials

Name	U-MAP Co., Ltd.		
Foundation	December 12, 2016		
Board member	CEO：Kenji Nishitani	COO：Takahiro Maeda	CTO：Toru Ujihara
Employees	20		
Capital	$ 1,000,000		

History

Establishment of R&D infrastructure and pilot production base for commercialization of new materials

2018
- Adopted for "New Aichi Research and Development Subsidy" by Aichi Prefecture*
- Accepted by the Ministry of Economy, Trade and Industry (METI) for the "Strategic Support for Advanced Technology (Supporter) Project "*
- Won "Grand Prix" at ILS Award 2018 / "Grand Prize" at CNB Venture Award 2018
- Selected for NEDO's "Support Project for R&D-based Startups in Seed Stage (STS) "*

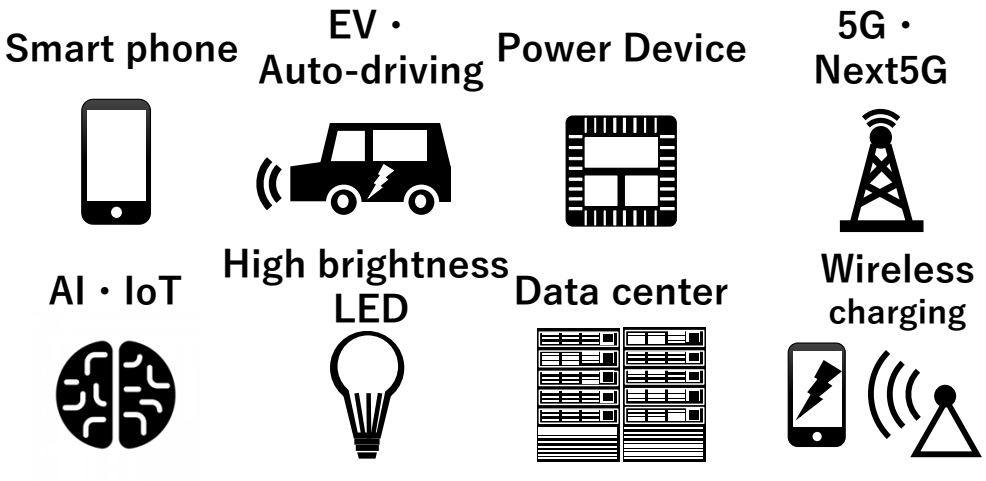
2019
- Selected for "New Aichi Creative R&D Subsidy" by Aichi Prefecture*
- Selected as one of the five hands-on companies in the “Aichi-Austin program “
- Selected for “Aichi Core Project III (2019-2021)”
- Won the Deep Tech Grand Prix "Grand Prize" and two "Company Awards

2020
- Selected for “NEDO's Strategic Energy Conservation Technology Innovation Program”*
- Selected as "J-Startup CENTRAL" in the Global COE Program

※ Subsidized projects by national professional organizations, etc.

Heat problems in all electronic devices

In order to dissipate the heat, the size of the equipment is increased and enormous cooling energy loss occurs.



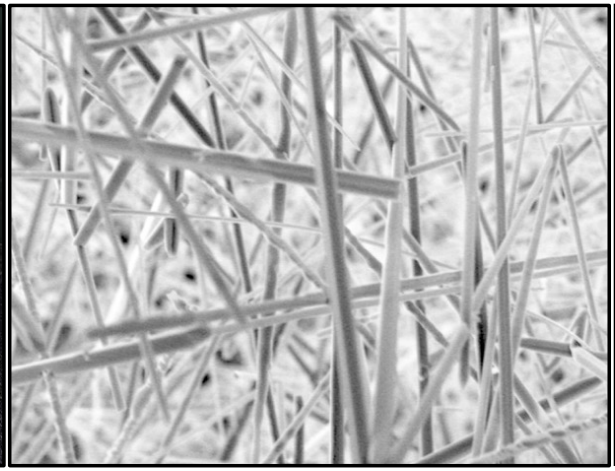
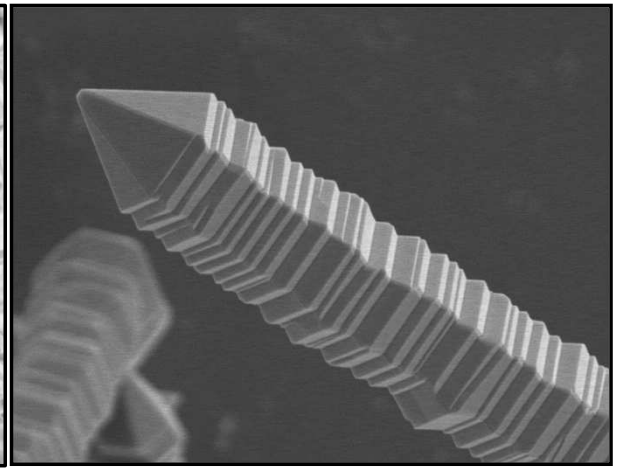
“Heat generation”
is the biggest enemy of electronic devices causing…

- **Performance degradation**
- **Decreased device life**
- **Reduced safety**

The key to achieving high heat dissipation performance is the filler material used in device components. U-MAP has developed a new filler material, which makes it possible to provide optimal components for electronic devices.

About Thermalnite®

It is a fiber-like aluminum nitride single crystal, which achieves high thermal conductivity and high water resistance.
As a filler material, it is expected to be applied to ceramics/resin composite materials.

✓ High Thermal conductivity ✓ insulation properties ✓ High aspect ratio
(Fiber shape)

Thermalnite's high quality mass production is

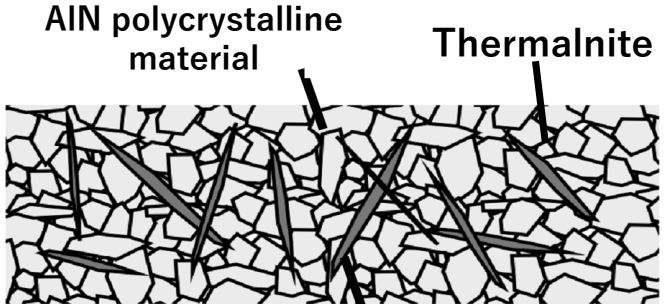
the world's only original U-MAP technology.

New Functional Composite Materials Using Thermalnite

Realization of ceramic/resin composites with unconventional thermal and mechanical properties

Composite materials added to ceramics

High thermal conductivity ＋ α
＋ α ＝ High mechanical strength

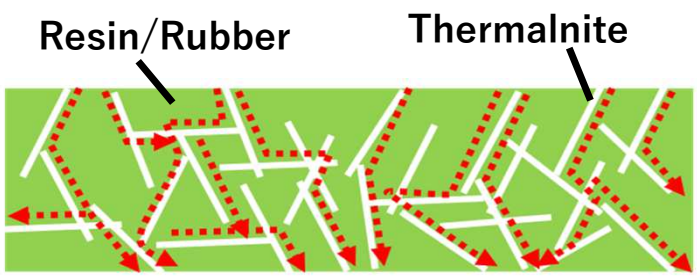


Improved properties by fiber reinforcement

High strength ceramics business

Composite materials added to resin and rubber

High thermal conductivity ＋ α
＋ α ＝ Resin characteristics



Create highly efficient heat paths

High thermal conductivity re sin materials business

This document introduces ceramic products.

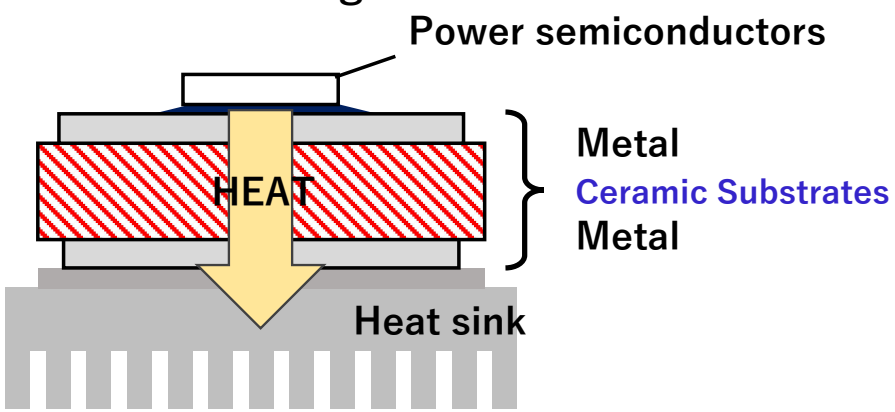
Ceramic Substrates with High Heat Dissipation

Physical properties of substrates are the key to improving the heat dissipation performance of conventional ceramic substrates.

Target products of ceramic substrates

- Power modules (for electric vehicles, railroads, power supply equipment, industrial motor equipment, etc.)
- LED/LD modules (headlights, LEDs for sterilization, optical transceivers for communication, etc.)

Power module schematic diagram.



To improve the heat dissipation performance of ceramic substrates

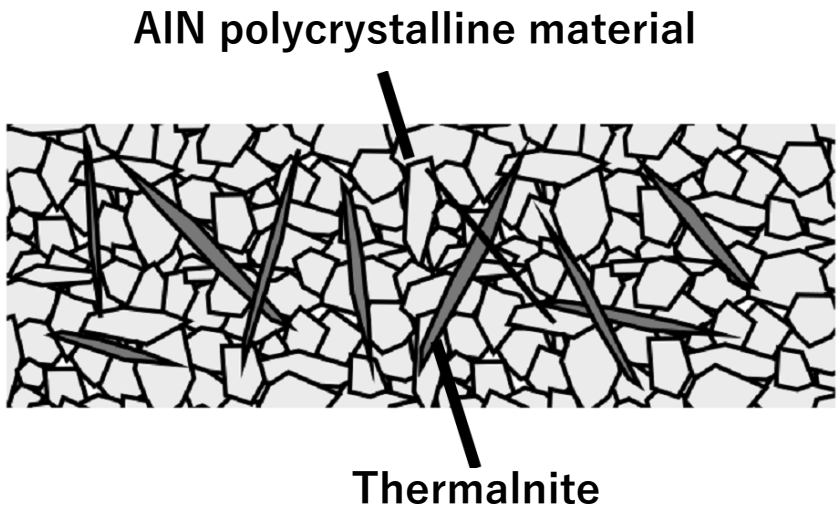
Improve the Thermal Conductivity of the material itself

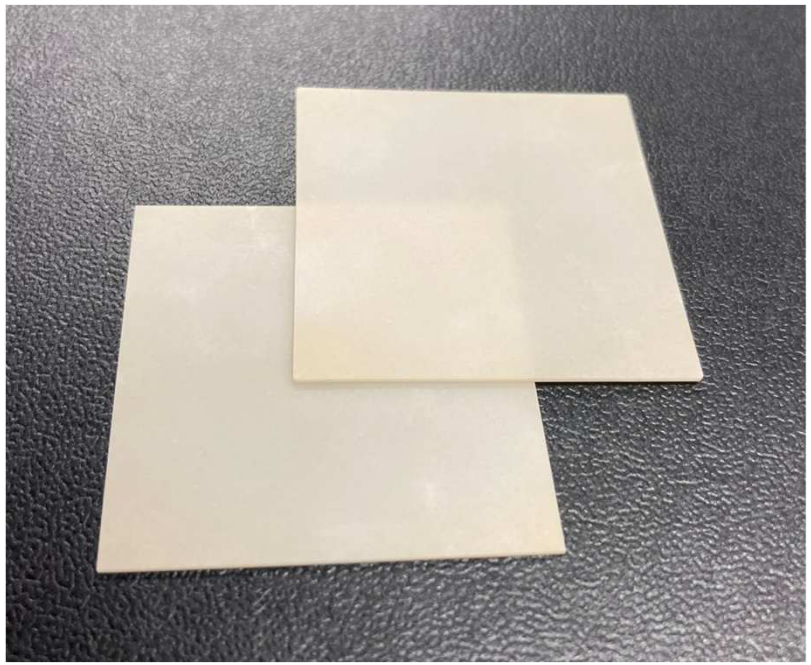
■ Make the substrate thinner
Reliability to withstand heat cycles

→Improvement of mechanical strength

Features of Thermalnite added Ceramics

Adding Thermalnite to aluminum nitride powder improves the strength.





Thermalnite added AlN Substrates

It improves the Mechanical Properties of AlN,

which is a weak point of AlN,

by realizing a columnar structure inside the substrate.

Competitive Advantages of Thermalnite added AlN Substrates

Achieves BOTH high mechanical properties (fracture toughness) and high thermal conductivity not found in conventional products.

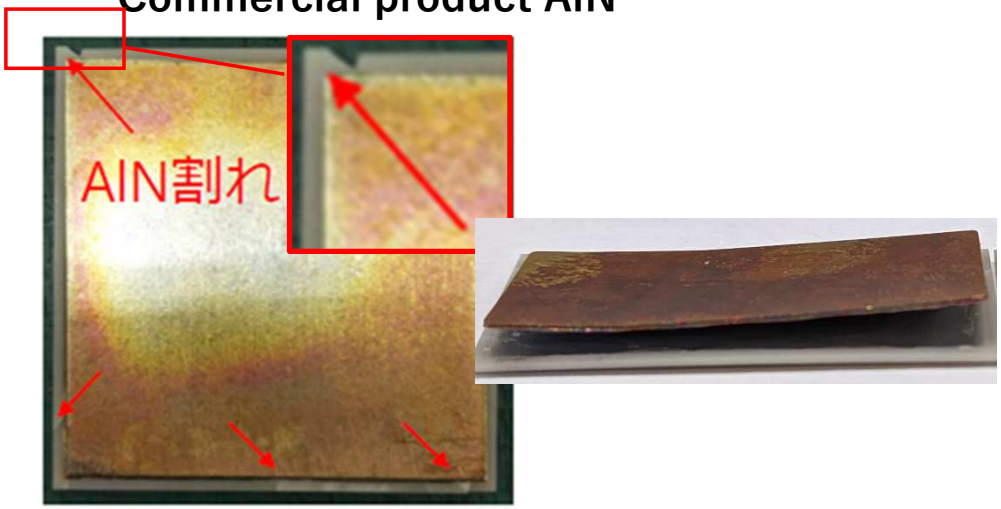
Characteristic Benchmarking of Ceramic Substrates

	Thermal Conductivity	Mechanical strength (Fracture toughness)	Dielectric breakdown voltage
Silicon nitride (Si3N4)	80	5～7	>15
Aluminum nitride (AlN)	≧200	2～3	>15
Thermalnite added Aluminum Nitride (AlN) Substrates	**≧200**	**5～7**	**20 (n=1)**

Thermal cycling test results for DBC substrates

- Sample size
  Structure: Copper 0.3t/AIN 0.635t/Copper 0.3t
- Cold and heat cycle test conditions
  Temperature range: -55~150° C

Commercial product AIN



Cracking occurs at 500 cycles.

Thermalnite added AIN

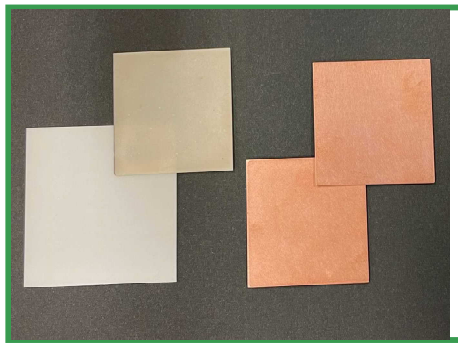
No cracking at 1500 cycles

High reliability was confirmed for U-MAP products by cold and heat cycle tests.

Ecosystem for commercialization

Building an integrated supply chain.

We partner with material manufacturers to provide the best materials for our users.



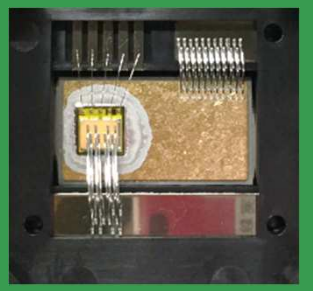
Production Partners

ceramics

metalize

Sales

Device maker

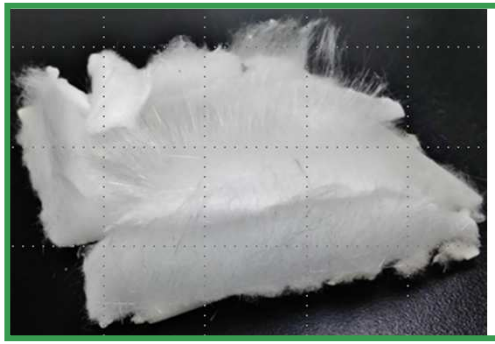


Sales

Technology Licensing

royalty

PoC/Co-development



R&D

If you are interested in our technology and would like to help us with our project, please contact us!

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Web Site

LinkedIn