U-MAP pitch deck

-Ultimate material and processing-

ThermaInite®

（Fibrous Aluminum Nitride Single-Crystal）

2024.1.24 ver

Overview

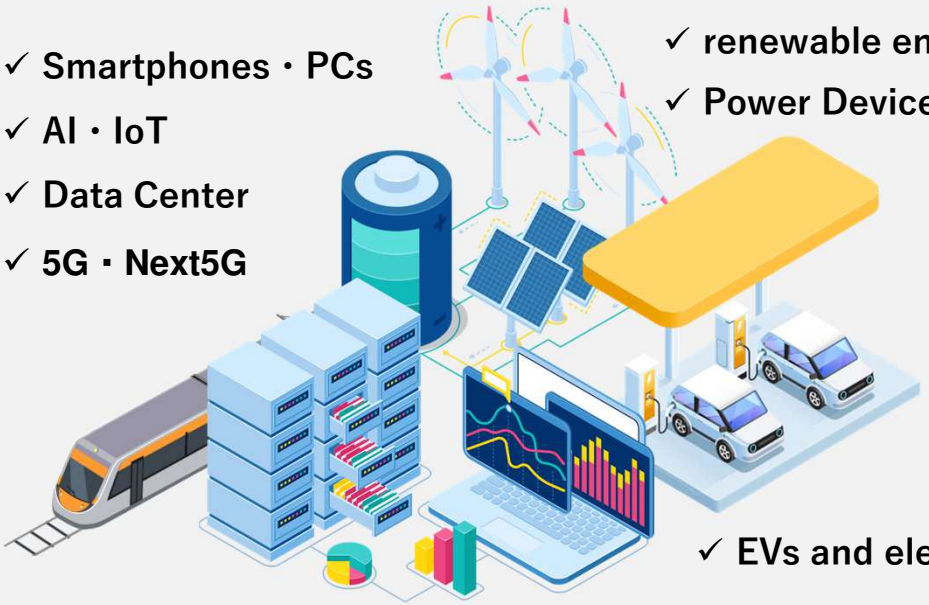
Name	U-MAP Co., Ltd.
Location	601, Tokai Open Innovation Complex (TOIC),Furo-cho, Chikusa-ku, Nagoya, Aichi, Japan　※Nagoya University premises
Founded	December 12, 2016 Founding
Board Member	CEO　Kenji Nishitani COO　Takahiro Maeda CTO　Toru Ujihara
Number of employees	30
Awards	ILS Award 2018 「**Grand Prix**」 CNB Venture Awards 2018 「**Grand Prix**」 Deep Tech Grand Prix 2019 「**Grand Prix**」「**Corporate Awards**」 DEEP TECH PIONEER 2021 Real Tech Venture of the Year 2021 「**Growth Award**」

The "Heat Problem" in the Electronics Industry

Due to the heat generated from internal components of electronic devices,
the inside of the devices becomes excessively hot.

As the demand for higher performance and miniaturization increases,
the issue of heat generation in electronic devices is becoming more serious.

- ✓ Smartphones・PCs
- ✓ AI・IoT
- ✓ Data Center
- ✓ 5G・Next5G



- ✓ renewable energy
- ✓ Power Devices
- ✓ EVs and electric trains

Effects of Heat Generation in Devices:

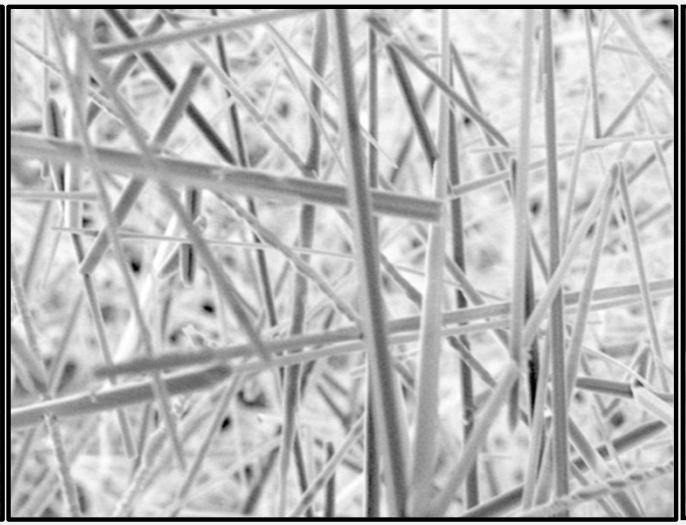
- ✓ Decrease in performance
- ✓ Shortened device lifespan
- ✓ Reduced safety

Contribution to energy-saving in all electronic devices with new materials

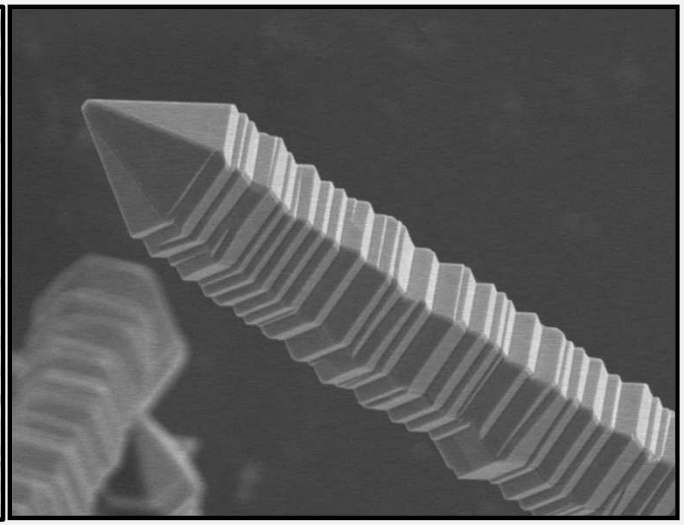
ThermaInite®

Fibrous Aluminum Nitride Single-Crystal

High thermal conductivity



Insulating properties



Fiber shape

World's only original U-MAP technology

U-MAP's Business

Creating novel ceramics and functional composites with Thermalnite.

Thermalnite Business

U-MAP's proprietary material "Thermalnite" developed

Products:

- Thermalnite (Standard/High Water Resistance Grades)

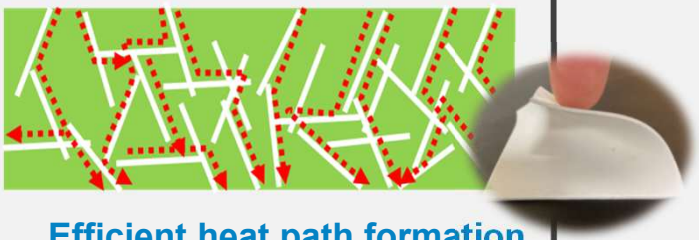
Achieving new materials with "high thermal conductivity + α" by adding Thermalnite.

Resin Component Business

Launching composite components with Thermalnite in resin and rubber

Products:

- Low thermal resistance TIM Sheet



Efficient heat path formation

High-Strength Ceramics Business

Developing composite materials with Thermalnite added to AlN

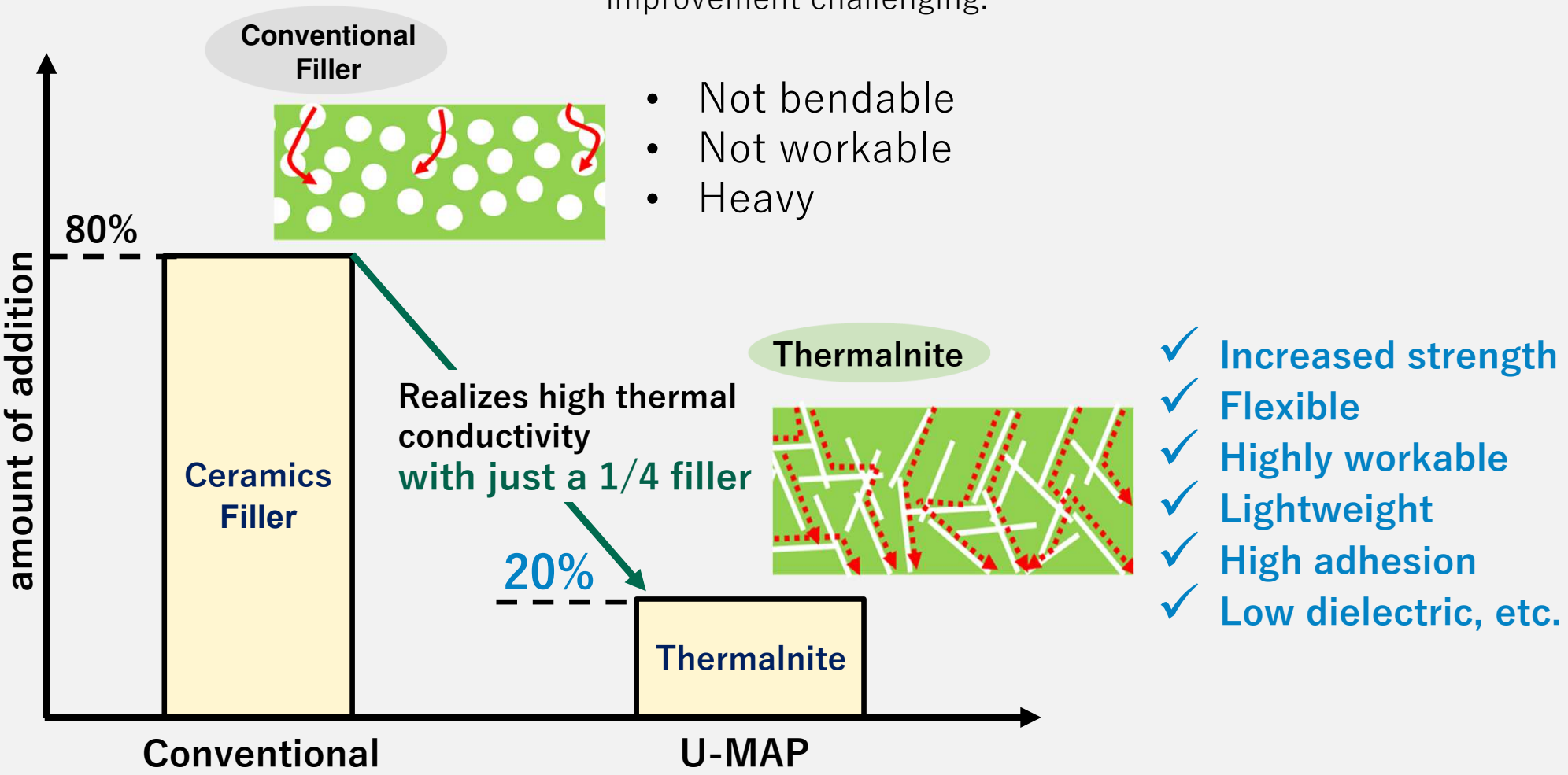
Products:

- High-strength aluminum nitride (AlN) substrates

Enhanced properties through fiber reinforcement

Benefits of Thermalnite: "Minimal Additive Amount"

Enhances the heat dissipation of insulating resin by incorporating thermal conductive fillers.
Traditionally, over 80% of the resin is filled with fillers, making further thermal conductivity improvement challenging.

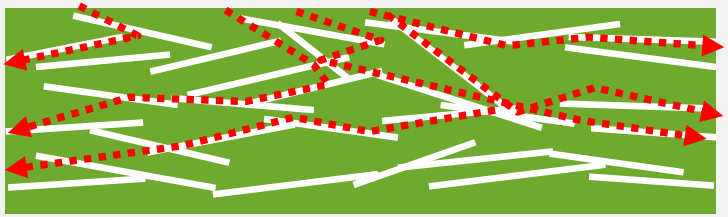


Achieves high thermal conductivity while maintaining resin characteristics with minimal additive amount.

Characteristics of composites added to resin

In-plane oriented (X-Y) structure

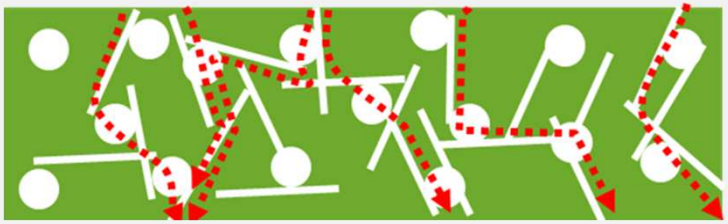
Small amount of Thermalnite only



Filler oriented in X-Y axis direction.
(Thermal conductivity in Z-axis direction is inferior.)

Randomly oriented structure

Hybrid addition of spherical filler



By hybrid structure with spherical filler,
creates isotropic heat conduction paths.

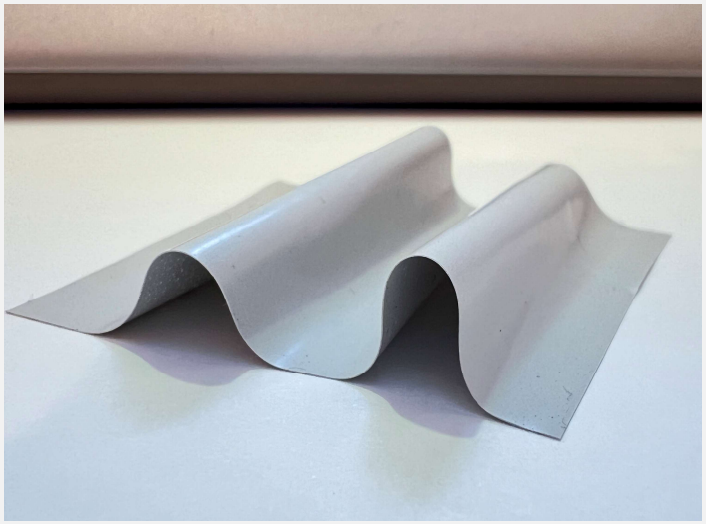
High Thermal Conductivity Resins	Ceramic filler Additive amount	Thermal conductivity [W/mK]
U-MAP	**10%**	**4.1**
	20%	**7.5**
	30%	**8.1**
	40%	**9**
DENKA※1	70~80%	3.3
HenkelAG※1	70~80%	6
住友大阪セメント※1	70~80%	7

Spherical Filler	Effect of TN* hybrid addition [*TN: Thermalnite]
Al_2O_3	Silicone resin increased **from 2.3 to 3.7 W/mK** by adding a **few percent of TN**
	Thermal conductivity increased **by 2.2 times** when **3 wt% TN was added to epoxy resin.**
BN	**Addition of 2 wt% TN** to silicone resin Thermal conductivity increased **from 10 to 14 W/mK**

ThermaInite-added TIM* sheet

*TIM (Thermal interface material)

- **Lowest thermal resistance in industry history - 15% reduction**
- **Industry's thinnest 0.1 mm (insulating)**
- **4 times the mechanical strength of conventional products**



■ Advantages of replacing the new product with a new product

Current TIM Sheet ▶

"Enhanced Cooling Efficiency and Reliability"

・Increase in power output due to lowered temperatures

・Wide range of use up to high surface pressure due to strong mechanical strength

Current heat dissipation grease ▶

"Improved Reliability and Productivity"

・Eliminates pump-out issues with increased longevity.

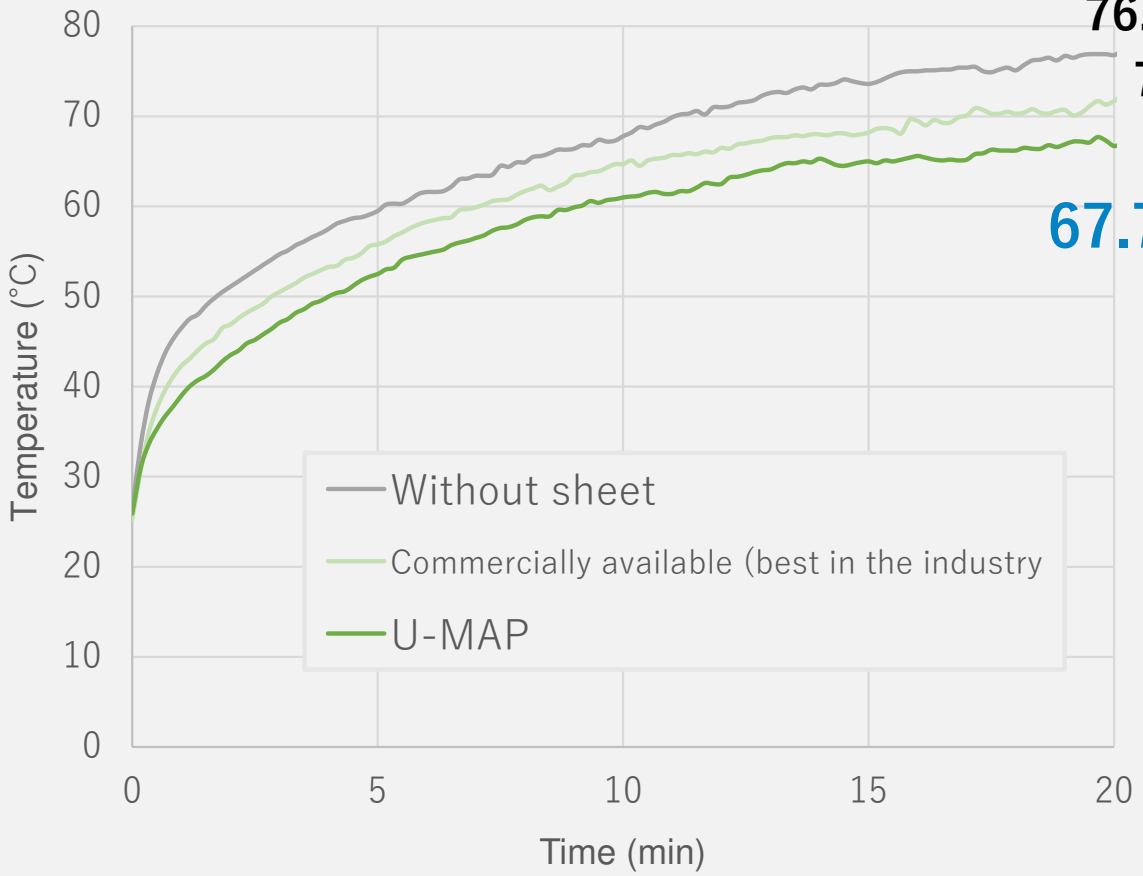
・Enhances labor efficiency and resolves uneven application.

Device cooling effect of TIM sheet

Reduced by 4°C

compared to commercial products

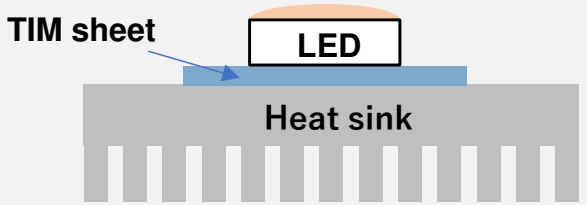
*When used as TIM sheet for LEDs

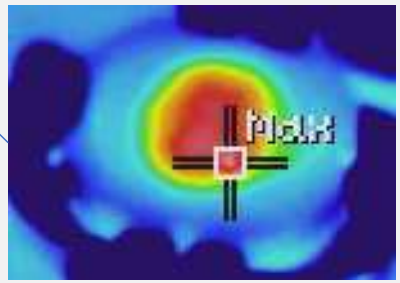


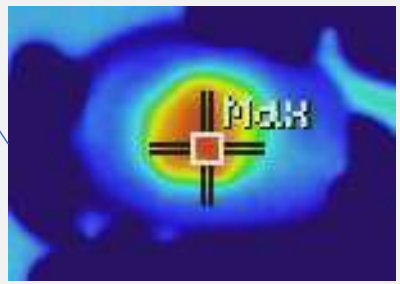
76.9° C

71.7° C

67.7° C







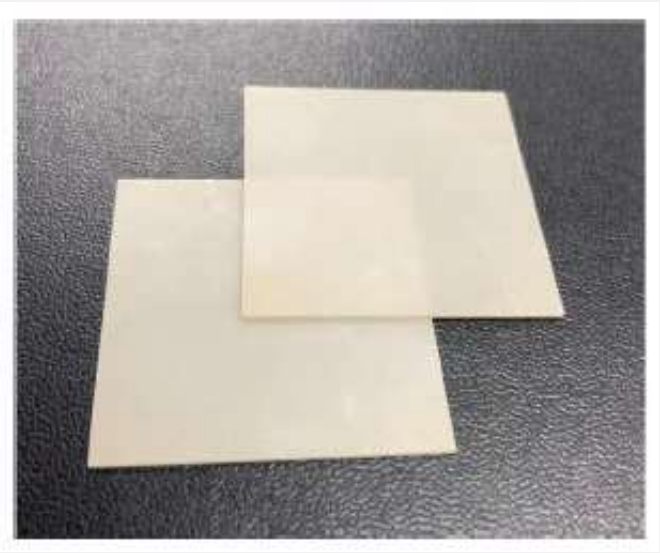
Confirmation of temperature reduction effect by using U-MAP products (TIM sheets) in devices

Thermalnite-added aluminum nitride substrate

By adding Thermalnite to aluminum nitride powder (polycrystalline body),
This improves mechanical properties and
overcomes the weak points of conventional products.

AIN polycrystalline body

Thermalnite



Thermalnite-doped aluminum nitride white plate

Double the mechanical strength of conventional products, the highest in the history of AIN.

- **Prevents cracking and chipping of substrates when bolted together**
- **High output and downsizing due to improved cooling efficiency with thinner plate**

Features of Thermalnite-doped AlN Substrates

Ceramics that combine high strength and high thermal conductivity are in demand.
Thermalnite is added to aluminum nitride powder
to increase strength through fiber reinforcement.

Characteristics of U-MAP Ceramic Substrates

	Thermal conductivity [W/mK]	Fracture toughness [Mpa・$m^{1/2}$]
Si_3N_4	△ 80~90 W/mK	○ 5~7 MPa・$m^{1/2}$
AlN	○ 170~200 W/mK	× 2～3 MPa・$m^{1/2}$
Thermalnite-added AlN substrate	**◎ ≧200 W/mK**	**◎ 5~7 MPa・$m^{1/2}$**

- ✓ "Achieves both mechanical properties (fracture toughness) and thermal conductivity not found in conventional products.
- ✓ Improved mechanical properties enable thinner designs, enhancing heat dissipation."

Thank you!

Contact us here

https://umap-corp.com/en/contact/