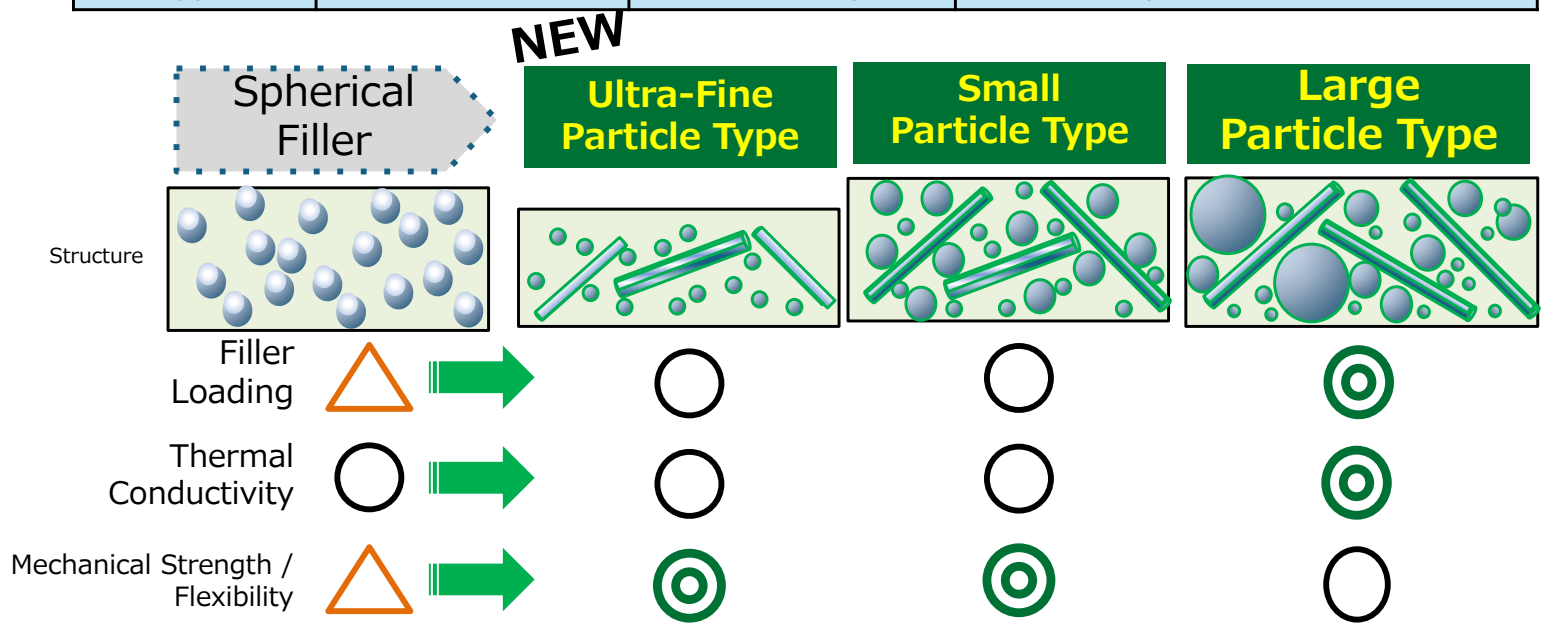
Introduction of Hybrid Filler

A precision-designed filler that “optimally blends” Thermalnite®
and spherical particles to build highly efficient thermal conduction paths

Specifications & Features

Optimized surface treatment for improved filler loading and flowability

	Thermalnite® Fiber Diameter	Spherical AlN Filler (with Thermalnite®)	Features
NEW Ultra-Fine Particle Type	Fiber diameterD50 : 5μm Fiber lengthD50 : 20μm	Particle size D90 : TBD	Ideal for ultra-thin adhesive applications.
Small Particle Type	Fiber diameterD50 : 5μm Fiber lengthD50 : 20μm	Particle size D90 : 60μm	Optimized for thin-film applications
Large Particle Type	Fiber diameterD50 : 5μm Fiber lengthD50 : 20μm	Particle size D90 : 180μm	Enables higher thermal conductivity



Example: Filler Loading vs Thermal Conductivity

	NEW Ultra-Fine Particle Type	Small Particle Type	Large Particle Type	
Resin Matrix	—	Silicone	Silicone	Epoxy
Filler Loading	40～60vol%	60vol%	80Vol%	80Vol%
Thickness	**20～50μm**	100～200μm	500～1000μm	500～1000μm
Thermal Conductivity	**2.0～3.0W/m・K**	**4.5W/mK**	**12.5W/mK**	**15W/mK**

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

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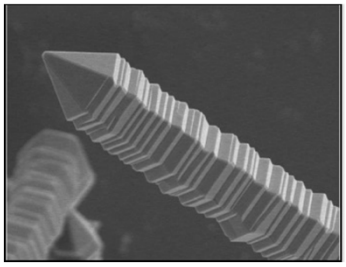
Fibrous Aluminum Nitride Thermalnite®

Appearance	High aspect ratio, fibrous Fiber diameter D50: 5μm, Fiber length D50: 20μm
Chemical Formula	AlN
Crystal structure	Hexagonal wurtzite
Density	3.26g/㎤
Mohs Hardness	9
Solubility	Almost insoluble in water
Reactivity	Hydrolysis is about 1/3 that of spherical AlN AlN + 3H2O →Al(OH)3 + NH3



Main Applications

Resins such as silicone and epoxy

Ceramic substrates

(especially AlN substrates)

Comparison of Various Thermal Fillers

Aluminum nitride offers higher thermal conductivity and a lower thermal expansion coefficient than other ceramics, and because Thermalnite® is a single crystal, its thermal conductivity is even higher

Filler Material	Chemical Formula	Thermal Conductivity [W/m・K]	Mohs Hardness [Mohs]	Thermal Expansion Coeff. [ppm/K]	Density [g/㎤]	Insulation [Ω・cm]
Thermalnite®	**AlN**	**250**	**9**	**4.3～4.8**	**3.26**	**10^{14}**
Aluminum Nitride (Spherical)	**AlN**	**170-230**	**7**			
Silicon Nitride	Si_3N_4	85	8～9	2.6～3.1	3.2～3.3	10^{13}～10^{15}
Alumina	Al_2O_3	25～39	9	7～8	3.9	10^{14}
Magnesia	MgO	40～60	6	11～13	3.6	10^{17}

We also offer custom-designed hybrid fillers.

To further tailor a general-purpose hybrid filler to your required specifications, we can undertake PoC development for higher dispersion, including filling analysis that simulates the optimal blend ratio using machine learning and selection of the ideal surface
treatment for the resin matrix. Please contact us for details.

※The blend ratio of the hybrid filler is not disclosed.
If required, an inspection certificate stating the following will be included upon product delivery.

1. Specific surface area measurement results
2. Particle size distribution measurement results
   - D50 values of major axis, minor axis, major-axis volume, and minor-axis volume
   - Cumulative probability graphs of fiber diameter and fiber length

Contact us ▲

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