

News Release

February 26, 2024

Proterial, Ltd.

Proterial Develops "MS-FH" a Highly Heat-Resistant Magnetic Shielding Sheet —Contributes to the miniaturization and weight reduction of electronic devices used in high-temperature environments—

Proterial, Ltd. (hereinafter referred to as "Proterial") has developed "MS-FH" a new highly heat-resistant magnetic shielding sheet with improved heat resistance over the "MS-F" magnetic shielding sheet made of nanocrystalline soft magnetic material FINEMET® (hereinafter referred to as "FINEMET"). MS-FH has improved heat resistance up to 130°C, 50°C higher than previous product, and is approximately 40% thickness. MS-FH contribute to the miniaturization and weight reduction of electronic devices.

1. Background

Our MS-F magnetic shielding sheet made of FINEMET provides excellent magnetic properties including high magnetic permeability^{*1} and saturated magnetic flux density^{*2}, as well as being thin, lightweight, flexible in its handling, and providing good processability for easy cutting, punching, etc. It has been used for noise suppression in a wide range of applications such as in electronic devices including mobile phones, PCs, cameras, in medical equipment such as X-ray diagnostic equipment, as well as shielded rooms designed to reduce geomagnetism and other external magnetic fields. In recent years, MS-F has increasingly been used in noise suppression applications for in-vehicle electronic equipment on xEVs^{*3}. However, sheets with heat resistance greater than MS-F were needed as its usable temperature was 80°C or lower, which meant that high temperature conditions on vehicles would cause its protective film and adhesive to deteriorate, and also affect its magnetic properties.

2. Overview

Through further research into MS-F's protective film, adhesive material, and manufacturing conditions, Proterial has successfully developed MS-FH, a new magnetic shielding sheet with a heat resistance of 130°C.

This magnetic shielding sheet has a structure where FINEMET and protective films are integrated by means of laminate molding (see illustration). Heat resistance issues in our previous MS-F sheets were mainly caused by the peeling of protective films due to the adhesive re-melting under high temperatures, as well as cracks, dropouts, etc., that would occur in FINEMET due to protective films shrinking due to their low heat resistance, resulting in deterioration of magnetic properties. Through further research into protective films, adhesive materials, and manufacturing conditions, these issues have been addressed in MS-FH, resulting in improved heat resistance.

In making improvements of protective films, we took into account not only whether the protective films would remain stable at high temperatures, but also their physical properties, and chose materials that would not deteriorate FINEMET's magnetic properties. Furthermore, manufacturing processes that may potentially affect the properties of FINEMET—especially conditions in lamination processes where thermal expansion and contraction occur due to heating—were revised, and this also contributed to achieving the magnetic shielding sheet's high heat resistance.

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MS-FH exhibited excellent heat resistance properties as evidenced by showing no deterioration to its protective film or adhesive, and no significant change to its magnetic properties after undergoing high temperature tests run at 130°C for 1,000 hours. As a result, it can be used in noise suppression applications at high temperatures where the previous MS-F magnetic shielding sheet could not. Resin materials and adhesives used in MS-FH are UL94 VTM-0*4 certified for high flame retardancy.

Furthermore, thanks to the protective films and adhesive layers being thinner than those in our previous product, MS-FH is only 0.05 mm thick, making it approximately 40% the thickness and weight of our previous product which was 0.13 mm thick. In achieving this, manufacturing problems that can occur with thinner protective films and adhesives were avoided by revising processing conditions. Also, with respect to any deterioration of its protective functions, reliability tests were conducted to verify that there were no problems.

In addition to its improved heat resistance up to 130°C, 50°C higher than previous product, its thinner profile means that MS-FH can be used in high temperature environments such as automotive applications and in narrow spaces that previously posed difficulties and in applications that are expected to diversify going forward, contributing to the miniaturization and weight reduction of electronic devices and other equipment.

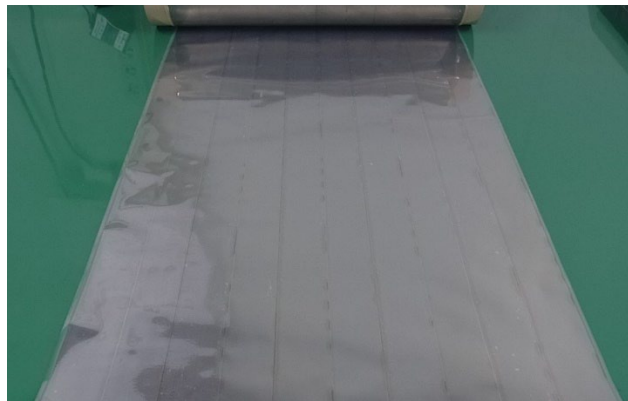


Photo: Highly heat-resistant magnetic shielding sheet "MS-FH"

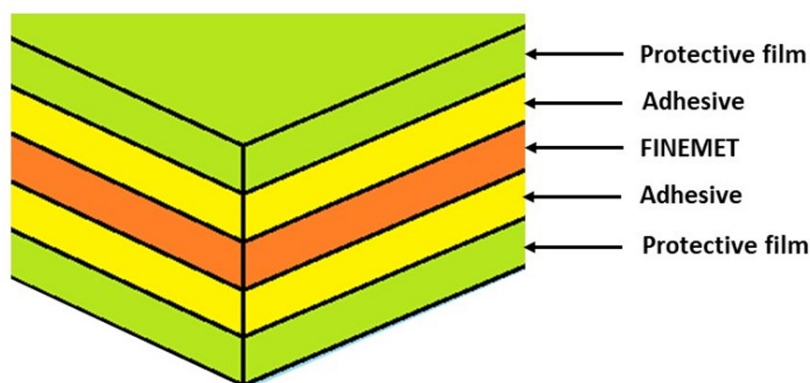


Illustration: Cross-sectional schematic of highly heat-resistant magnetic shielding sheet "MS-FH"

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Comparison of characteristics between the new product and previous product

Type	MS-FH (New product)	MS-F (Conventional product)
Saturated magnetic flux density B_{800} (DC $H=800A/m$)	$\geq 1.1T$	
Maximum magnetic permeability μ_{max} (DC)	$\geq 70,000$	
Thickness	0.05mm	0.13mm
Service temperature range	-40~+130°C	-40~+80°C

3. Production Status

Sample availability: Started from December 2023. Mass production scheduled to start in December 2024

4. Patents

Patents pending

- *1: Magnetic permeability: This value indicates the ease at which magnetism is able to pass through a material.
- *2: Saturated magnetic flux density: Magnetic flux refers to the flow of magnetism per unit area and represents the strength of a magnet. While magnetic flux density will increase when an external magnetic field is applied to a magnetic material, there is a limit to flux density beyond which it will not increase any further. The higher this value, the stronger the magnet.
- *3: xEV is a generic term that refers to electric vehicles. It covers BEV (Battery Electric Vehicle), HEV (Hybrid Electric Vehicle), PHEV/PHV (Plug-in Hybrid Electric Vehicle/Plug-in Hybrid Vehicle), FCEV/FCV (Fuel Cell Electric Vehicle/Fuel Cell Vehicle), etc.
- *4: UL94 VTM-0: The most demanding rating under UL94, a standard established by Underwriters Laboratories Inc. (UL) to certify the flame retardancy of materials.

FINEMET is a registered trademark of Proterial, Ltd.

Media inquiries: Corporate Communications Dept.

https://www.cntct.proterial.com/contact/publish/inquiry_eng?g=01&c=001-01

Customer inquiries: https://www.cntct.proterial.com/contact/publish/inquiry_eng?g=01&c=010-05

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■About PROTERIAL

PROTERIAL

“Proterial” reflects the essence of our corporate philosophy, which consists of three elements: Mission: “Make the best quality available to everyone;” Vision: “Leading sustainability by high performance;” and Values: “Unfaltering integrity” and “United by respect.” It combines “pro-” with the word “material.”

“Pro-” represents our “three pros”:

- Professional — work that exceeds expectations
- Progressive — a spirit that keeps challenging
- Proactive — an enterprising attitude

“Material” refers to the high-performance materials that our original technologies produce and underpinned by the three pros. With our focus on solving customer issues and bringing new levels of value, we promise to contribute to the realization of a sustainable society through the products and services that embody our philosophy.

■Proterial, Ltd. — Company Overview

Established: April 1956

Head office: Toyosu Prime Square, 5-6-36 Toyosu, Koto-ku, Tokyo 135-0061, Japan

Capital: 310 million yen (as of March 31, 2023)

Representative: Representative Director, Chairman, President and Chief Executive Officer (CEO)
Sean M. Stack

Sales revenue: 1,118.9 billion yen (Term ended March 2023)

History: 1910: Founded as Tobata Foundry Co.

1937: Merged with Hitachi, Ltd.

1956: Established separately as Hitachi Metals Industries, Ltd.

2023: Company separated from the Hitachi Group, and renamed from Hitachi Metals, Ltd. to Proterial, Ltd.

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