Resin Coated Metal Sheet, FCOAT®

1. INTRODUCTION

The Metals Company of Furukawa Electric has brought to the marketplace FCOAT® products, a series of resin coated metal sheets for electromagnetic shielding case for RF components in mobile phones and the like.

As mobile equipment improve in functionality and compactness, the components mounted are required to be low in profile, rendering it difficult to ensure electrical insulation using conventional metal cases. Accordingly, demands are growing for such materials that make electromagnetic shielding and electrical insulation properties compatible, using metal and resin.

FCOAT sheet is a material that combines a metal substrate and a resin film, developed in order to meet the needs mentioned above. We have established a comprehensive production system including the base alloys and have promoted mass production targeting at power amplifier modules and camera modules. Since the product is increasingly employed in various electronic equipment centering on mobile phones, we intend to expand its varieties including plating specifications so as to meet various requirements. See Figures 1, 2 and Photos 1, 2.

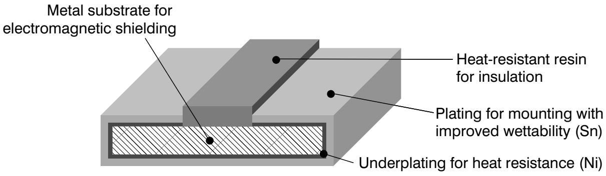

Figure 1 Structure of FCOAT.

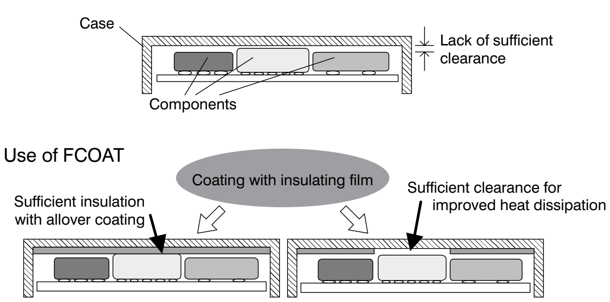

Figure 2 Schematic of FCOAT application.

Photo 1 Appearance of FCOAT sheets.

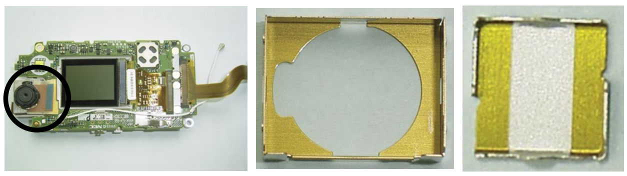

Photo 2 Applications of FCOAT for mobile phones.

2. FEATURES

(1) Electromagnetic Shielding Performance

Because FCOAT sheets use metallic substrates including copper alloys and stainless steels, they are best suited for electromagnetic shielding cases for RF components.

(2) High Electrical Insulation and Heat Resistance

Polymer resins with high electrical resistance are used in coating, including polyamideimide and polyimide for high-temperature applications. Thus, high reliability in electrical insulation is maintained even in harsh environments and after reflow mounting.

(3) High-precision Stripe Coating and Heat Dissipation

The resin is coated in multiple striped films with high precision, so that the sheet is applicable to mounting of multiple components, ensuring high heat dissipation as well.

(4) High Formability

The resin has superior elongation and adhesiveness properties, so that the sheet is suitable for press forming such as precision stamping, bending and drawing.

(5) Heat-resistant Solderability

For solder-mounting, plating with superior wettability for soldering is available including underplating finish with Ni/Sn solder.

(6) Low Cost

Because FCOAT sheets are resin-coated products without using expensive polyimide films and the like, they enable shortening of working time as well as significant cost reduction.

(7) Quick Delivery

Quick delivery of not only volume products but also prototype products can be ensured, including the products of modified specifications with respect to the number, width and position of the striped coating.

3. SPECIFICATIONS

Typical specifications of the products are shown in Table 1. Please contact us for other specifications not shown here, since we intend to expand the manufacture range.

Table 1 Typical specifications of FCOAT sheets.

Construction		Specifications
Base material	Metal/Alloy	Cu-Sn-P (Phosphor bronze), Cu-Ni-Zn (Nickel silver), SUS (Stainless steel), etc.
	Thickness	0.1 to 0.35 mm
	Width	6 to 50 mm
Resin film	Coating area	Striped or whole area
	Resin	Polyamideimide, Polyimide, Epoxy, Polyester, etc.
	Thickness	3 to 20 μm
	Accuracy of thickness	±3 μm from center
	Coating width	2 to 48 mm
	Number of stripes	About 2 to 3
	Accuracy of position	±0.1 to 0.2 mm
Plating	Material	Ni, Sn, etc.
	Thickness of underplating	~ 2 μm
	Thickness of external plating	~ 10 μm

4. PROPERTIES

Table 2 shows the evaluation results of the properties of typical FCOAT resins. It can be seen that the resins maintain, after severe reliability tests, superior resin properties, formability, wettability for soldering and high electrical insulation. We recommend polyamideimide for the coating resin from the standpoint of cost and processing reliability.

Figure 3 shows the relationship between the resin film thickness and breakdown voltage. The resin has high withstanding voltage, making FCOAT sheets applicable to connectors.

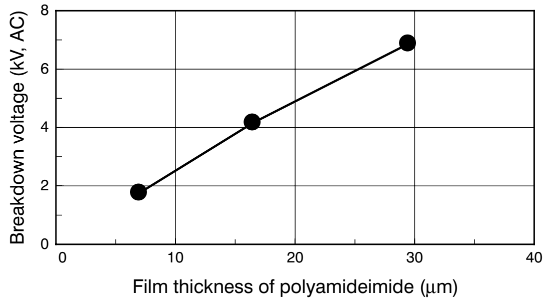

Figure 3 Relationship between resin film thickness and breakdown voltage.

5. APPLICATIONS

In the future, FCOAT sheets are expected to be used in various electronic applications including RF components and connectors in mobile phones as the digital functionality ever upgrades. They are suitable for

Table 2 Comparison of the properties of typical FCOAT resins.

Reliability tests	Evaluation items / Resin	Polyimide	Polyamideimide	Epoxy
Cost of resin (Relative)		10~30	1	1
Cost of product (Relative)		1.2~1.8	1	1~1.2
Material construction	Resin thickness	8 μm	7 μm	7 μm
	Plating	1μm-Ni/2μm-Sn	1μm-Ni/2μm-Sn	1μm-Ni/2μm-Sn
	Base alloy	6%Sn-Phospor bronze	6%Sn-Phospor bronze	6%Sn-Phospor bronze
As manufactured	Electrical resistivity (Ω)	$\geq 2.63\times10^{13}$	$\geq 7.45\times10^{12}$	$\geq 7.91\times10^{10}$
	Solderability	○	○	○
	Pencil hardness of resin film	7H	9H	6H
	Resin adherence after forming	○	○	○
	Plating adherence	○	○	○
	Plating color change, 150 °C x 2 hr, or 220 °C x 20 min	○	○	○
PCT exposure, 121 °C x 96 hr, 2 atm, 100%RH	Electrical resistivity (Ω)	$\geq 1.97\times10^{13}$	$\geq 6.42\times10^{11}$	$\geq 4.99\times10^{10}$
	Resin adherence after forming	○	○	○
Heat cycle, from –55 °C x 30 min to 125 °C x 30 min, 200 cycle	Electrical resistivity (Ω)	$\geq 1.08\times10^{14}$	$\geq 4.40\times10^{12}$	$\geq 3.62\times10^{10}$
	Resin adherence after forming	○	○	○
Low-temperature exposure, –40 °C x 1000 hr	Electrical resistivity (Ω)	$\geq 1.10\times10^{14}$	$\geq 1.00\times10^{12}$	$\geq 1.77\times10^{10}$
	Resin adherence after forming	○	○	○
High-temperature exposure, 85 °C x 1000 hr	Electrical resistivity (Ω)	$\geq 1.25\times10^{14}$	$\geq 1.27\times10^{14}$	$\geq 2.62\times10^{11}$
	Resin adherence after forming	○	○	○
Humidity exposure, 85 °C x 1000 hr, 85%RH	Electrical resistivity (Ω)	$\geq 1.05\times10^{14}$	$\geq 1.62\times10^{14}$	$\geq 1.25\times10^{10}$
	Resin adherence after forming	○	○	Δ (Crack in bent or tensioned outer layer)
Reflow resistance, 270 °C x 5 min, 5 cycle	Electrical resistivity (Ω)	$\geq 1.19\times10^{10}$	$\geq 1.13\times10^{10}$	$\geq 1.43\times10^{10}$
	Pencil hardness of resin film	6H	5H	9H

replacing the conventional processes of film insertion and attachment, thus reducing costs, and also for coping with model changes being supported by quick delivery.

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