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THERMAL RADIATION COATING ON ANODIZING ENCLOSURE

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Thermal Radiation Coating on Anodizing Enclosure

Abstract

This invention is to apply thin graphene thin coating layer (5-10 μm) on anodized aluminum and aluminum alloy substrates by using only 1-5 graphene layer (0.3-1.5 nm Z-height thickness), particle size 3-10 μm , and aspect ratio 1,500-10,000 in coating formulation to achieve high-performance heat dissipation and reduce the skin temperature by 3-4°C on laptop platforms.

Background

Copper and/or graphite heat spreader film are the common thermal solution to be applied in the laptop housing, which has much higher in Z-height by 0.1-0.15 mm.

Invention Description

Thin graphene thin coating layer (5-10 μm) on anodized covers can provide high performance heat dissipation through heat spreading and thermal radiation mechanism to reduce heat induced from hot spot zones in CPU, GPU, battery, and PCB areas as shown in Figure 1. The measured thermal conductivity of graphene is in the range 3000 - 5000 W/mK at room temperature. 2 Graphene coat formulations are to be applied including waterborne graphene coating and waterborne UV graphene coating solutions.

Cross-Section View

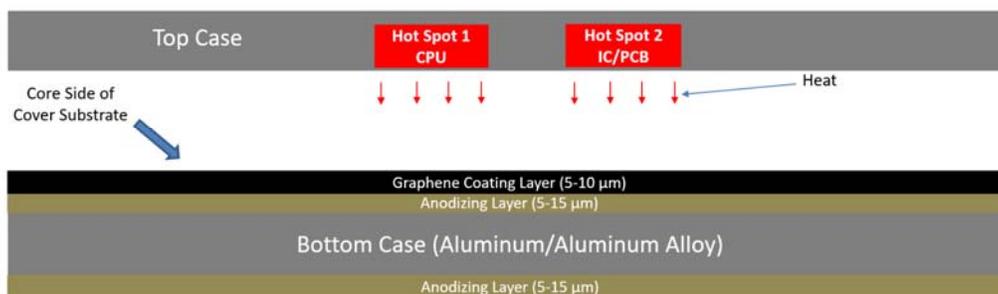


Figure 1. Graphene Coating on Anodized Cover

Advantages

- Provide a low skin temperature thermal solution by applying thin graphene thin coating layer (5-10 μm) on anodized aluminum and aluminum alloy substrates by using only 1-5 graphene layer (0.3-1.5 nm Z-height thickness), particle size 3-10 μm , and aspect ratio 1,500-10,000 in coating formulation to achieve high-performance heat dissipation.
- Reduce the skin temperature by 3-4°C on laptop platforms.
- Effectively release lots of the heat from laptop housing due to large surface area on the cover through thermal radiation mechanism.

- Eliminate graphite and/or copper heat spreader (0.1-0.15 mm) and decrease Z-height by 0.09-0.14 mm (90-140 μm) to enhance the heat convection in the laptop with graphene thin coating by spray drying process.
- The measured thermal conductivity of graphene is in the range 3,000-5,000 W/mK at room temperature.
- Offer a thin laptop design feature.
- Extend product lifetime such as LCD panel, LED, CPU and battery lifetime.
- Avoid the risk of battery explosion.
- Improve information loading speed and power efficiency.
- Apply thermal solutions for electronic devices such as notebook, tablet PC, smart phone, TV, etc.

Disclosed by Kuan-Ting Wu/Hendry Huang/James Chang/Wisdom Huang, HP Inc.