

## **A Thermally Functionalized Structural Material for Heat Spreading in Handheld Devices**

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### **Abstract**

New Technology for clad metals will be described which enables thermal functionalization of structural components for use as thermal management materials in consumer and handheld devices. By selectively replacing under-utilized structural space with highly conductive materials, thermal heat spreading performance in these devices can be substantially improved. A new composite material system utilizing conventional metals will be presented to serve both structural and heat spreading purposes, utilizing high stiffness stainless steel skins clad over a low density, highly conductive Aluminum 1100 core. This configuration melds the best properties of each material, creating a fully formable composite structure with excellent mechanical (153 GPa bending modulus) and bulk thermal transport properties (160 W/mK). Manufactured in a reel-to-reel cladding process, the composite material is fully formable allowing it to be efficiently stamped into high volume components using existing tooling. It will be shown that the bulk thermal transport in the thick aluminum core can provide improved heat spreading compared to common micron-scale carbon based materials. Using conventional materials, thermal functionalization of structural components with the new Stainless - Aluminum clad composite has the potential to (1) streamline device manufacturing by reducing the bill of materials, (2) improve heat dissipation, and (3) reduce material costs by elimination of specialty heat spreaders.