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nScrypt & Sciperio 3D Manufacture Conformal Heaters

With Variable Resistance Traces

Orlando, FL: A recent study conducted by a team in nScrypt's research arm, Sciperio, demonstrated a significant improvement in the performance of conformal Printed Circuit Structures (PCSs) through the use of novel manufacturing techniques made possible by nScrypt's high-precision Factory in a Tool. The research focused on improving 3D manufactured conductive traces and vias to increase total yield and tunability of performance. These improvements were then practically demonstrated by printing a circuit with conformal heating elements, which can be used in a wide range of applications, including wearable technology, heating systems, and electronic devices.

The study found that the use of stacked conductive layers for traces significantly reduced resistance compared to single-stacked traces. The resistance steadily dropped as the number of layers increased, reaching a 92% decrease from layer 1 to layer 7 without oven curing, and showing significantly less resistance than a single layer trace of equal height. The additional height of the stacked trace can be compensated by embedding the trace into the 3D manufactured circuit structure.

In addition, a via fill method using the nScrypt SmartPump was developed in which via walls were coated with conductive material using a vacuum extraction technique. The study found that the vacuum evacuation method was effective in connecting 49/50 vias, with an average resistance of 4.8mΩ and a standard deviation of 0.47mΩ.

The team applied these developments in a demonstration PCS that incorporated conformal printed heating elements made possible through stacked traces. The heating elements were printed with varying numbers of stacked conductive layers per section, highlighting the tunability of resistance without needing to alter trace widths.

Ken Church, CEO of nScrypt and Sciperio, said:

"The lower resistance traces we made with nScrypt's Factory in a Tool open the door for higher-power conformal PCS circuitry. Our improved via yields also allow for increased circuit density. These advances bring the performance of PCSs closer to that of traditional PCBs and are an important step toward high-performance electrically functional devices of virtually any shape."

About nScrypt

Orlando, Florida-based nScrypt designs and manufactures award-winning, next-generation, high-precision microdispensing, 3D Manufacturing, and biomanufacturing equipment and solutions for industrial applications, with unmatched accuracy and flexibility. Serving the printed electronics, electronics packaging, solar cell metallization, communications, printed antenna, life science, chemical/pharmaceutical, defense, space, 3D printing, and bioprinting industries, our equipment and solutions are widely used by the military, academic and research institutes, government agencies and national labs, and private companies. The nScrypt BAT Series Bioprinter, which won the 2003 R&D 100 award, launched to the International Space Station in July 2019. www.nScrypt.com.