REDUCING THE COST OF APPLYING ULTRA-THIN, PACKAGE LEVEL EMI SHIELD COATINGS

Stuart Erickson
Ultrasonic Systems, Inc.; Haverhill, MA 01835 USA
serickson@ultraspray.com

OVERVIEW

As highly sensitive circuit assembly components become more tightly packed, demand for cost-effective package-level EMI (electromagnetic interference) shielding increases. The process cost for applying a thin (less than 10µm) conductive metal EMI shielding layer to individual packages is substantial when traditional sputtering and plating methods are used.

A new technology offers a way to apply sprayable coatings that provide highly-effective EMI shielding performance. T-CAT (ultra-Thin Coating Application Technology) is a proven application method that applies a uniform, ultra-thin layer, while reducing the process cost by up to 60%. [1]

T-CAT Spray Coating Technology

The need for EMI shielding is increasingly important as highly-sensitive components become more tightly packed in circuit assemblies. To accommodate the move toward miniaturization and to reduce weight and thickness, each individual package may require EMI shielding [2]. Sputtering and plating are commonly used to apply component-level EMI shielding layer between 3 and 6 µm thick. These methods add substantial cost to the process, are limited to moderate throughput, and add complexity to the process flow.

New EMI shield coating materials recently available in the market are high-density slurries with proprietary formulations that produce a continuous conductive layer on the substrate after coating. These new materials provide excellent EMI shielding characteristics for package-level shielding. Since these coatings can be applied with a much simpler, more scalable, and cost-effective spray coating process, such as T-CAT, they enable manufacturers a straightforward path to higher board densities, increased design flexibility, and simplified the bill of materials for smaller, lighter device designs.

Ultra-Thin Coating Application Technology (T-CAT) is a direct-spray method for applying a uniform and conformal layer on the top and side surfaces of individual components. T-CAT utilizes "nozzle-less" ultrasonic spray technology combined with a precision coating system platform that contains the ultrasonic spray head, a precision metering pump liquid delivery system, a spray head motion and positioning system, and a transport system for the substrates to be coated.

Using T-CAT, spray is produced without the use of a nozzle. Liquid is applied to a spray forming tip and broken into small drops by ultrasonic energy, then accelerated and expanded by an adjustable-velocity air stream to produce a uniform, rectilinear coating pattern.

This technology is capable of spraying a wide variety of materials from pure solutions to suspensions and slurries while producing a uniform coating layer on the substrate. [3]

Figure 1 shows the nozzle-less ultrasonic spray head assembly, which consists of an ultrasonic transducer with a spray forming-tip, an integrated liquid applicator, and air director.

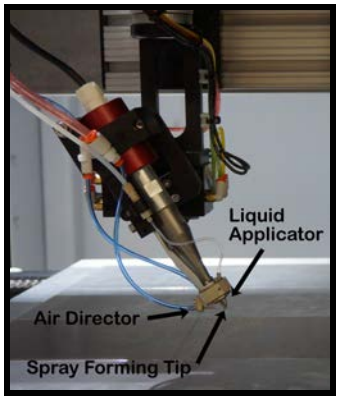

Fig. 1: Nozzle-less Ultrasonic Spray Head Assembly

The T-CAT Liquid Delivery System

An integrated liquid delivery system has been developed that incorporates a positive displacement metering pump as shown in Figure 2. The liquid flow rate is controlled by micro-stepping drive ensure that the coating material is delivered to the ultrasonic spray head at a precisely controlled flow rate. The operation of the liquid delivery system is seamlessly controlled by the T-CAT software.

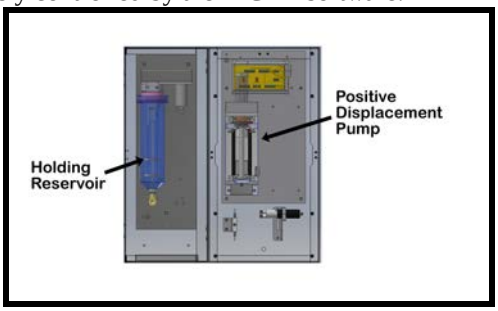

Fig. 2: Liquid Delivery System

Since some coating formulations used for EMI shields have suspended particles that can settle out this liquid