Multi-axis Process integration for Wafer scale and Substrate-Like Printed electronics
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Organic-based HDI packaging technology has enjoyed widespread use in various forms in recent years. However, its effectiveness has been constrained by line and space limitations, restricted to 40 microns. The growing interest in chip-level disintegration or chiplets has underscored the imperative for heightened levels of multichip integration and progressively smaller feature sizes for PCBs. In response to this demand, wafer-scale packaging technologies that incorporate substrates/interposers such as silicon and glass have emerged, capitalizing on foundry capabilities that do not necessitate the stringent process node feature sizes required for chiplet packaging. This not only facilitates enhanced integration but also contributes to driving down wafer costs.

Enter substrate-like PCBs (SLP), positioned strategically between WSP and HDI, pushing line and space feature sizes below 30 microns. The burgeoning 5G market serves as a key driver for the adoption of SLPs. Traditionally flat or conformal, SLPe is made possible through a modular factory with a tool capability, encompassing processes such as aerosol printing of interconnect, photonic curing, micro dispensing of solder dots, chip assembly, and in-situ metrology.

Wafer-scale packaging (WSP) and Substrate-like PCB's (SLP) typically involve integrating multiple semiconductor devices on a single wafer to create a compact and high-performance system. The specific processes and technologies used for wafer-scale packaging can vary, with companies employing different tools and equipment based on their requirements.

nScrypt, an OEM in Direct Digital Manufacturing, has been dedicated to achieving full product manufacturing in a single tool. This integration and multi-axis movement capability cover core areas, including:

- Microdispensing Technology: nScrypt has developed microdispensing systems capable of handling a variety of materials, including solders, conductive inks, adhesives, and other functional materials. This technology is often applied in precision applications requiring controlled deposition of small material volumes.
- **3D Printing:** nScrypt's expertise extends to 3D printing technologies. They have developed solutions that offer high precision and versatility for a range of applications, including electronics, biomedical devices, and more.
- **Advanced Manufacturing Solutions:** nScrypt has positioned itself as a provider of advanced manufacturing solutions, offering equipment and technology for applications that require intricate and high-precision processes.

If you are considering solutions for wafer-scale packaging, you may want to explore the nScrypt product offerings related to microdispensing and 3D printing to determine how they can be applied to your specific packaging needs. Considerations such as material compatibility, precision, and throughput are crucial when evaluating any technology for wafer-scale packaging. The precision and scaling capability offered by nScrypt bridge the gap between WSP and SLP packaging technologies, providing precision placement for multi-level stacking and integration of glass and ceramic substrates for custom multichip packaging. Additionally, the nScrypt DDM toolbox, using their technology system, allows incorporation of various processes, including

wide area and selective plasma cleaning, milling/micromachining and many curing and sintering options.

To learn more, please reach out to the nScrypt sale and applications team, or meet me at the upcoming IMAPS Device Packaging conference in March, where I serve as the Printed Electronic session co-chair and will also be presenting on the same topic outlined here in this article.
https://imaps.org/page/Device-Packaging