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Abstract

Ultra-Precise Deposition: Additive Manufacturing Process for Next-Generation Electronics

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Additive manufacturing (AM) offers tremendous possibilities for the fabrication of next-generation electronics and devices for medical applications. Yet, there are several challenges to using AM techniques for microfabrication. The miniaturization trend requires printing ultra-thin and highly conductive interconnects on complex 3D and heterogeneous substrates. In our presentation, we will demonstrate how the Ultra-Precise Deposition (UPD) method tackles challenges beyond the reach of other AM techniques.

UPD is a versatile approach to printing micrometric conductive and non-conductive structures on various rigid and flexible substrates. The process allows maskless deposition of highly-concentrated silver, copper, and gold pastes, up to 85 wt. % of solid content. The printed feature size can be as small as 1 µm, and the maximum electrical conductivity obtained in this range is around 45% of the bulk material. The physics behind the process, the means to control it, and the nanopaste synthesis can be found in Łysień et al. [1]. In this contribution, we will focus on specific features and use cases beyond the reach of other AM techniques. The examples include: 1) printing on 3D topographies for advanced packaging; 2) printing structures for high-frequency signals, for example, the antenna on chip and 5G/6G communication; 3) printing flexible devices, like sensors, using both high and low viscosity materials (10-2.5M cP) with a wide range of feature size (1-200 µm linewidth).

During our presentation, we will demonstrate that the printing technology developed by XTPL is bringing an enabling approach for applications that cannot be done with known subtractive methods and for use cases where other additive approaches cannot fulfill all the requirements.

AUTHOR'S STATEMENT
Authors state no conflict of interest. Informed consent has been obtained from all individuals included in this study. Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies and was performed in accordance with the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or equivalent committee. Research funding: The authors state no funding involved.

REFERENCES
[1] Łysień et al., Sci Rep 12, 9327, 2022

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