

Polymer-Metal 3D Printing using hybrid material extrusion

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Abstract:

Additive manufacturing technologies not only enable the flexible production of customized products, but also provide new opportunities for integrating electronics into the component structure. Multi-material processing, quality control, reliability and productivity are some of today's challenges. The main objective of the Pompey project is a hybrid manufacturing device that supports FFF printing processes for polymers and material extrusion for low-melting metal alloys. This provides a cost-effective and efficient system for manufacturing multi-material components for a wide range of applications. A nozzle specially adapted to the printing process of low-melting-point metals was developed to meet the requirements of the project. By using suitable simulation models, it was possible to optimise the thermal management within the nozzle. The newly developed nozzle enabled the production of 3D printed tracks with excellent homogeneity and defect-free structure, with a track width almost equal to the inner diameter of the nozzle. Multi-material printing has been successfully implemented through its integration into an existing commercial polymer filament printer. This involved modifying the path planning software to suit the process. A condition monitoring system and CAM software for interactive track design have also been developed. The innovative nozzle, combined with appropriate sensor systems, data collection and analysis, promotes environmental aspects, including resource and energy efficiency and repair, as well as circular economy considerations.

Content of the poster:

- Nozzle design and simulation of temperature management
- Integration of the metal print head in polymer printer

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