A090 ENGR

Design of a Coaxial 3D Printing Nozzle for Direct Write Epoxy Resins

Abstract

Coaxial nozzle systems are widely used for material extrusion-based printing. It enables the combination of two different printing materials (polymers, epoxy etc.) and can be designed for a broader range of materials. In this study, we designed a coaxial nozzle system which is easy to disassemble and clean. By using a simple computer aided design (CAD) of a coaxial nozzle we simulated the flow of two distinct epoxy-based formulations. Epoxy-resins are recognized and often used for their various properties in the aerospace industry and biomedical systems. In our design, the physical properties of nozzle material such as elasticity, conductivity, heat capacity and hardness were taken into consideration. It is compatible with commercially available Luer lok 3D printing tips and Luer lok tubing adapters. With rapid developing methods, coaxial extrusion has demonstrated potential in bioprinting, an emerging branch in tissue engineering.

The increase in science, technological and industrial interest has demanded developments that have surpassed single nozzle apparatus for complex geometries that coaxial nozzles can perform across biomedical, energy and environmental applications.