

## **Effects of nozzle die angle on extruding polymethylmethacrylate in open-source 3D printing**

### **ABSTRACT**

Open-source 3D printer has been widely used for fabricating three dimensional products. However, this technology has some drawbacks that need to be improved such as accuracy of the finished parts. One of the factors affecting the final product is the ability of the machine to extrude the material consistently, which is related to the flow behavior of the material inside the liquefier. This paper observes the pressure drop along the liquefier by manipulating the nozzle die angle from 80° to 170° using finite element analysis (FEA) for polymethylmethacrylate (PMMA) material. When the pressure drop along the liquefier is varied, the printed product also varies, thus providing less accuracy in the finished parts. Based on the FEA, it was found that 130° was the optimum die angle (convergent angle) for extruding PMMA material using open-source 3D printing.

**Keyword:** Nozzle die angle; Open-source 3d printer; Polymethylmethacrylate