

Mechanical characteristics of compressive specimens obtained by SLS technology

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Abstract

The purpose of this research is to investigate the mechanical properties of Additive Manufacturing (AM) parts. The 3D printer used in this study is Fuse 1 (FormLabs, Summerville, MA), which utilizes the SLS (Selective Laser Sintering) technology. This technology allows the production of objects with different shapes and dimensions simultaneously, provided that they are printed at a minimum distance of 5 [mm] apart. The powder layer thickness during printing was 110 microns. The mechanical characteristics of a specific type of specimen, which conforms to the ISO 604 standard for compressive specimens, were examined. The compressive specimens have dimensions of Ø10x20 [mm]. Four batches of specimens were produced, each differing in printing orientation (i.e. horizontal and vertical) and printing location (i.e. printed on the edge and in the middle of the powder bed). The material used for printing the specimens is polyamide (PA 12), which has a compressive strength is 13/24/55 MPa at 1%/2%/5%. The specimens were subjected to a standard tensile testing machine (SHIMADZU AGS-X 100kN) after printing.

Furthermore, the results of the testing also showed significant variations in the compressive strength of the specimens at different levels of elongation. At 1% and 2% elongation, the compressive strength values displayed large deviations, which suggests that the parts may not be able to withstand high levels of deformation at these points. However, at 5% elongation, the values were much closer to the expected values found in the literature.

Keywords: SLS technology; compression specimens; PA 12; printing orientation