INFLUENCE OF PRINTING PARAMETERS ON DIMENSIONAL STABILITY OF SENB SPECIMENS MADE FROM PLA AND PLA-X MATERIALS

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Abstract

The subject of this paper is to show how two similar materials, namely PLA and PLA-X, influence on geometrical properties of additively manufactured SENB (Single-Edge Notched Bending) specimens. Observed geometrical properties are specimen density and percentage error of measured specimen dimensions i.e., specimen thickness (B), width (W) and length (L). CAD model dimensions of all specimens are 13 × 26 × 114.4 [mm], and for all specimens plane-strain criterion is met according to the ASTM D5045-14 standard for fracture toughness assessment of plastic materials. SENB specimen notch width and depth are 1.5 × 10.5 [mm], respectively. For each material specimens were 3D printed in five different batches, with variation in layer height, infill density, printing orientation and specimen humidity. Considered layer heights are 0.1 and 0.2 mm, infill densities taken into account are 50 and 100 % and all specimens have rectilinear or circular printing orientation. Fifth batch includes dried specimens for both materials. Results show that the maximum density for both materials have the specimens with 100% infill density and 0.1 mm layer height. Also, the highest dimensional error concerning specimen thickness (B) is measured in the same batch for both materials. The maximum error with regard to specimen width is measured in the batch with 50% density and 0.1 mm layer height. Largest dimensional deviation in specimen length is measured in dried PLA specimens, showing the effect of specimen drying on dimensional accuracy of the largest specimen dimension. Conversely, in the same batch PLA-X material shows minimal deviation.

Keywords

Additive manufacturing, PLA, PLA-X, geometrical properties, SENB specimen

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