ANALYSIS OF PARAMETER IMPACT ON 3D PRINTED EXPERIMENTAL SAMPLES FOR TENSILE TESTING

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Abstract

One of the current problems in practice of preparing functional parts, prototypes and constructions is insufficient knowledge of 3D printing parameters for various advanced materials, which often results in failure to obtain required 3D prints. Users of 3D printers and distributors alike are at high risk that the results of their 3D printing may fail due to the use of advanced materials that are not sufficiently tested. Chosen 3D printing technology is FDM (Fused Deposition Modeling), a commercially available and widespread additive manufacturing technology. Crucial impact on mechanical properties and durability of 3D printed FDM parts are chosen parameters for printing. The input of parameters is done using adequate slicer software, which prepares the G-code for stepper motors and heaters-who runs the whole 3D printing process on the machine. Previous studies show that printing parameters such as layer height, print speed, infill pattern and percentage, print orientation and temperature have a crucial impact on mechanical properties of printed parts. This technology still shows improvements, mostly in the field of new materials. Every breakthrough in the material field requires thorough testing, in order to acquire mechanical properties and determine material behaviour in exploitation.

In order to extend the application of production of functional parts and prototypes obtained using additive manufacturing technologies, overviewing exploitation behaviour of conventional and advanced materials due to different conditions of 3D printing, the 3D printing parameters have been varied in order to attain its influence on mechanical properties of experimental samples, that are to be used in tensile testing. This research shows that prime mechanical properties, such as tensile strength, deformation at break, Young's modulus and toughness, may vary up to 30% in their value according to chosen printing parameters.

Keywords

3D Printing, FDM, Parameter impact, Sample, Tensile testing

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