# The effect of printing parameters on crushing behavior of 3D printed Nylon and CF/Nylon samples using Powder Bed Fusion and Material Extrusion techniques

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A B S T R A C T

3D printing techniques are becoming more common within several industrial fields due to their many benefits. These benefits include customized properties of final products, design independence, demand-driven manufacturing, waste alleviation, and the ability to produce complex parts, as well as fast prototyping. Parts manufactured using the powder bed fusion or material extrusion process are achievable by various building parameters. In this investigation, a comprehensive study was undertaken to clarify the variation in the compressive and impact strength of SLS prepared Nylon Polyamide and FDM prepared Nylon/CF parts at different building parameters. Significant methodological parameters were studied: infill patterns/layer layouts (triangular and rectilinear), wall thickness (1.2, 3.6, 6), and infilled density (70, 85, and 100%), utilizing material extrusion and powder bed fusion 3D printing machines. The Central Composite Face-centered (CCF)method was applied to design an optimal number of experiments. Experimental results demonstrated that Nylon Polyamide and Nylon/CF samples present slightly different crashing patterns and mechanical behaviors when tested for compression and impact. Compression characteristics of all tested samples are progressive folding and lateral shearing failures amalgamation. Rectilinear samples are mechanically weaker than Triangle samples.

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