Parametric improvisation of the selective laser sintering procedure to attain the supreme hardness and density in sintered TPU parts

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Abstract

Additive manufacturing techniques like Selective Laser Sintering (SLS) allow for the creation of prototypes in a wide range of shapes and sizes by using powder material. Thermoplastic polyurethane (TPU) is a polymer that sees extensive usage in the manufacture of functional parts across a wide extent of industries, including the automotive and aerospace sectors as well as the realms of medicine and athletics. Output properties include density and hardness greatly impacted by the various laser sintering settings, which in turn affect the quality of TPU-manufactured products. Therefore, the higher accuracy of end-use functional components relies heavily on the selection of sintering settings. This research investigates the relationship between the hardness and density of laser sintered parts and factors like part orientation, laser power , and layer thickness . Using the Taguchi parametric technique L9, we ran trials with varying values for each process parameter to zero in on the optimal settings and quantify the relative importance of each variable. The results demonstrate that laser power, layer thickness, and component orientation are the most critical factors in optimising the density and hardness of thermoplastic polyurethane (TPU) using SLS processing.

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