

3D Printing of Metal-Glass Hybrid Material Objects using Modified SLM with Dual Frequency Ultrasonic Selective Powder Delivery

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In this paper, we present a new approach of combining point-by-point selective powder delivery with powder bed fusion for multiple material (metal/glass) components 3D printing. Dual ultrasonic vibration was used to achieve stable flowrates of both 316 L steel and soda-lime glass powders which were dispensed selectively and separately. The effects of the stand-off distance and the scanning speeds on the quality of the formed layers were investigated. The glass-metal interface characteristics were investigated. The results showed that the ratio between the stand-off distance and the powder size (h/d) should be lower than 3 for accurate selective material deposition. Different laser processing parameters were developed for processing the metal and glass due to material property differences. A number of 3D objects consisting of metal and glass were printed using this method.

Keywords: multi-material, 316L, 3D printing, SLM, additive manufacturing, glass, powder feeding, ultrasonic