

Laser powder bed fusion additive manufacturing of functionally graded multiple metallic material components

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Multiple materials additive manufacturing provides a new opportunity to fabricating functionally graded materials (FGM) whose composition transits smoothly from one material to the other. Previous metallic material additive manufacturing technologies including laser powder bed fusion (L-PBF) or selective laser melting can only produce FGM samples with vertical material transition. In this work, we present a new multiple materials additive manufacturing method with ultrasonic multiple powder material delivery, modified from the conventional L-PBF, to fabricate 316L stainless steel /Cu10Sn copper alloy FGM components with horizontal and spatial material variations successfully. Up to six material compositions can be selectively deposited on the same powder layer using a proprietary ultrasonic powder-dispensing array. Macrostructure, microstructure, and phases of the FGM components were analysed.