

FEM Simulations to Study the Effects of Laser Power and Scan Speed on Molten Pool Size in Additive Manufacturing

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Abstract : Additive manufacturing (AM) is increasingly crucial in biomedical and aerospace industries. As a recently developed AM technique, selective laser melting (SLM) has become a commercial method for various manufacturing processes. However, the molten pool configuration during SLM of metal powders is a decisive issue for the product quality. It is very important to investigate the heat transfer characteristics during the laser heating process. In this work, the finite element method (FEM) software ANSYS[®] (work bench module 16.0) was used to predict the unsteady temperature distribution for resolving molten pool dimensions with consideration of temperature-dependent thermal physical properties of TiAl6V4 at different laser powers and scanning speeds. The simulated results of the temperature distributions illustrated that the ratio of laser power to scanning speed can greatly influence the size of molten pool of titanium alloy powder for SLM development.

Keywords : additive manufacturing, finite element method, molten pool dimensions, selective laser melting

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