Discrete Element Modeling of Powder Dispensing and Laser Heating in Direct Laser Metal Sintering Process

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ABSTRACT

The growth of reliable methods to improve part created from additive manufacturing technologies greatly depend on the quantitative understanding of the mechanical properties and the microstructural behavior of the powder particles during the 3D printing procedure. To obtain a greater understanding of this process, a particle- based discrete element modeling (DEM) has incredible potential benefits in the field of manufacturing for reducing cost and control specific structures and materials of the parts created from this process.

In this research, we developed a numerical tool and use it to study the powder characterization of the powder deposition process in the Direct Metal Laser Sintering (DLMS) machine. Our simulations include the modelling of particle insertion, particle spreading, and temperature distribution due to laser beam sintering process.

The DEM simulation results show that the particle distribution of the powder bed after powder dispersing process. Temperature distribution after laser heating is also given.