# ADDITIVE MANUFACTURING OF METALS: ESTABLISHING LOCATION SPECIFIC, PROCESSING-MICROSTRUCTURE-PROPERTY-RELATIONSHIPS

Advancements in additive manufacturing technology have created the ability to design and construct parts with geometries and properties that cannot be achieved through traditional solidification and deformation processes. This ability has promoted new design strategies whose success relies on close integration of engineering and materials science. Tailoring specific material properties in low-volume production is of particular interest. In principle, engineers can now 'print' complex 3-dimensional shapes with internal features that can be optimized to meet a wide range of operational constraints and service conditions. An additional attractive aspect of additive processing is the ability to custom design specific properties within the component by layering, thereby promoting different microstructures or compositions (e.g., functionally-graded materials). The repetitive rapid melting and solidification that occurs during the fabrication process is dominated by transient phenomena, which can create unexpected variations in the composition and performance of the component. Thus, establishing an understanding of this process and its effect on properties requires integrating a variety of computational and experimental methods across various length and time scales. This includes detailed 3-dimensional characterization as well as numerical modeling of thermodynamics kinetic phenomena. The transient nature of the rapid solidification can result in non-equilibrium phases, which result in properties which differ from materials fabricated by conventional processes.

The main objective of this symposium is to develop a better understanding of the input-material requirements, process capabilities, and their effects on finished product properties. Research that elucidates the process-structure-property relationships resulting from rapid solidification and transient phase transformations is greatly needed. Abstracts are requested that relate transient phenomena, recrystallization, transformation, and rapid solidification to additive manufacturing and its influence on phases, microstructure, and mechanical properties.

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