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Additive Technologies

Additive Manufacturing: Processing Effects on Microstructure and Material Performance

After chemistry, materials processing is the most powerful tool available to materials scientists and engineers for microstructural development and control, and ultimately to optimize material properties for a given application. Thermo-mechanical processing, such as hot rolling or forging, is used to develop consistent, reliable properties in conventionally manufactured materials. Further thermal processing is often used to tailor material properties and the performance of a final component for specific applications. Additive manufacturing (AM) is unique in that it is not only a technique to produce parts of specific, potentially highly complex, geometries, but also functions as the primary material fabrication and processing mechanism. This novel characteristic of AM results in both challenges and opportunities not encountered in traditional manufacturing methods. Because AM is a near-net-shape process, complex, internal geometries may be inaccessible for post-build processing, while the use of plastic deformation to develop and control microstructure is limited or completely unavailable. This leaves only the AM processing, post-build heat treatment, and a handful of other processing techniques for microstructure and property/performance control and optimization. However, in addition to AM offering a method of producing component geometries impossible to produce by any other manner, it also allows unique processing conditions such as rapid solidification and location-specific material chemistry, microstructure, and properties.

This symposium seeks to further the understanding of how AM processing and post-processing affects the structure and properties of material, and on how process optimization can be utilized to control microstructure and performance of materials and components produced via AM.

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