

VOIDS IN MATERIALS: ADDING FUNCTIONALITY DURING ADDITIVE MANUFACTURING

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An often overlooked implication of controlling materials at ever smaller length scales is the control of the inevitable void spaces contained in those materials and components. This miniaturization is widespread and at these small length scales, properties become size dependent, trending toward more ideal material properties. This is corroborated by the extensive selection dispersed phases such as nanotubes and nanometer-scale particles that are available. The technique of additive manufacturing is gaining enormous attention as it offers the ability to make multifunctional components that cannot be made by traditional processing routes. In additive manufacturing, more precise control of material placement presents a unique opportunity to build functionality by the simultaneous control of solid material and voids at multiple length scales. We present an overview of the functionality of voids from the atomic to the millimeter scale, highlighting the current research involving the introduction of voids in additive manufacturing and present future opportunities to incorporate voids by specific additive manufacturing techniques to add functionality.