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Additive manufacturing of carbon nanotube metal matrix composites

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Additive manufacturing has the potential to revolutionize the production of aerospace, automotive and other hardware and components. One area of significant potential is in the fabrication of metallic parts. However, the current state of the technology is not sufficient to meet the current needs of many of these applications. Current selective laser sintering (SLS) based techniques typically produce structures with less than wrought mechanical properties. While direct laser melt (DLM) and e-beam based additive manufacturing approaches have demonstrated wrought mechanical properties these results still put metallic additively manufactured components at a disadvantage compared to other aerospace materials systems. Carbon fiber composites systems typically offer significant improvements in strength, modulus and density but require more production processing and labor. In order for additive manufacturing to succeed a new materials system will need to be developed that is compatible with additive manufacturing and provides a significant improvement in mechanical performance. Recent articles published in academic literature indicates that a carbon nanotube metal matrix composite offers the potential for additively manufactured structures to have tensile modulus and tensile strengths comparable to carbon fiber composites while having superior compressive mechanical properties. By taking advantage of the ability of additive manufacturing to produce structurally more efficient designs, the use of carbon nanotube metal matrix composites, enables the ability to produce lighter weight aerospace structures at a lower cost.

Biography

Fred Herman has a Bachelor's degree in Mechanical Engineering from the Ohio State University, a Master's degree in Engineering Management from National Technological University and is currently pursuing a Master's degree in Material Science. He has nine issued patents including three in the area of additive manufacturing with nanomaterials. He is currently the section leader of manufacturing engineer at CDI Corporation.

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