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Investigation of laser beam forming process on Ti64 via material characterization studies

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Ti6Al4V is a titanium alloy commonly used in orthopedic implants, due to its high mechanical strength, corrosion resistance and biocompatibility. Traditional shaping techniques for such implants include casting and the use of mechanical force. Unfortunately, the small size and unique shape requirements of orthopedic implants render such techniques inadequate. As a result, the effects of novel metal-shaping methods on different materials are being explored. Laser forming, or thermal bending, uses a non-contact laser to induce a thermal gradient along a single axis of the sample. The process relies on the respective contraction/expansion of the metal to force the metal to bend. The extent to which the metal bends depends on the metallurgical/mechanical properties and a variety of factors that have yet to be characterized. In this research, the changes in the metallurgical and mechanical characteristics of the Ti6Al4V parent material and thermally bent, laser formed Ti6Al4V, were studied with respect to varying laser strengths. The surface roughness, hardness and microstructure for each laser power were evaluated and compared, using a profilometer, the Vickers hardness test and scanning electron microscopy, respectively. The conclusions of this research reveal any alterations in the material characteristics of each sample as a result of the laser power used and indicate usefulness as a biomedical implant material.

Biography

Courtney E. Kodweis, age 21, is currently working in her bachelor's in Biomedical Engineering at the University at Buffalo, SUNY. Her work was published in the National Conference on Undergraduate Research Proceedings and has taken on the post of vice president of the NY Nu Chapter of the Tau Beta Pi Engineering Honors Society, for the current school year. In August, she returned from conducting this research in Hyderabad, India, as part of the Milwaukee School of Engineering International Research Experience for Students Program. In the near future, Courtney hopes to continue her biomedical engineering education through an accredited M.D. /Ph.D. program.

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