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Effect on mechanical properties in heat treated and non-heat treated EOS 17-4 GP1 stainless steel parts produced using direct metal laser sintering (DMLSTM)

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Direct metal, involves the use of powder bed fusion methods in additive manufacturing to produce free-form shapes in metal. EOS Gmbh manufactures the direct metal laser sintering (DMLS) machine, which uses a laser to selectively heat metal powders to create a part in a layer-wise manner. Until now, nitrogen is used to atomize the samples within the build chamber during manufacturing using Stainless Steel 17-4PH. Greatbatch Medical, a medical device manufacturer in the US, produced samples for this study atomized with argon. In this study, the tensile strength and hardness of samples produced were analyzed after different post-processing methods were applied, that is, untreated, heat treated, stress relieved, and heat treated and stress relieved. The hardness of the EOS GP1 Stainless Steel was determined by micro-indentation tests using the Vickers scale. The hardness is based on the applied force divided by the surface area of the indentation. The Vickers hardness can be used to give estimation on what the tensile strength should be. The 17-4GP1 SS tensile bars were placed in tension to create a stress-strain diagram. The diagram gives important information of the yield strength, ultimate tensile strength, and the fracture point. This data helps determine if heat treatments improve the mechanical properties of EOS GP1 Stainless Steel.

Biography

Benjamin Alan Coopland is in his last year for obtaining his bachelor's degree in Mechanical Engineering at the age of 21 years from Milwaukee School of Engineering (MSOE). His senior design project is engineering a new chassis system for the MSOE Society of Automotive Engineering's Formula Hybrid vehicle. He was selected to do research at the Non-Ferrous Materials Technology Development Centre, Hyderabad, India, through the International Research Experience for Students program.

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