

Analysis of grain structure and surface roughness in heat treated and nonheat treated EOS 17-4 GP1 stainless steel parts produced using direct metal laser sintering (DMLSTM)

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Direct metal laser sintering (DMLS™) uses powder bed fusion methodology to produce freeform shapes using different alloys. The EOSsint M270 machine was used to produce the stainless steel 17-4PH by Greatbatch Medical, a medical device manufacturer in the US. The process uses metal powder and a high powered fiber laser to sinter a usable part layer by layer. Due to the nature of the additive manufacturing process, quantifying the material properties of the manufactured parts continues to be a challenge as testing standards are still being worked on by ASTM International's committee, F42. The main objective of this research was to determine if the metallurgical properties of grain structure and surface roughness of the DMLSTM EOS GP1 stainless steel (SS) produced parts subjected to these heat treatment processes deviated from that of an untreated sample part. Grain structures were investigated by polishing and etching cross-sections of the samples and examining them underneath a Scanning Electron Microscope (SEM). The surface roughness was determined for the non-machined surfaces of the DMLS™ tensile bar samples using a profilometer. This instrument was used to calculate average surface roughness values for quantitative analyses.

Biography

Jenna M. Staffaroni is currently a fourth year student of bachelor's degree in Biomedical Engineering at the Milwaukee School of Engineering. There, she is an active member of Lambda Zeta Nu sorority and the Biomedical Engineering Society (BMES). At the age of 21, she was chosen to take part in an International Research Experience for Students (IRES) Site in Hyderabad, India where this research was conducted.

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