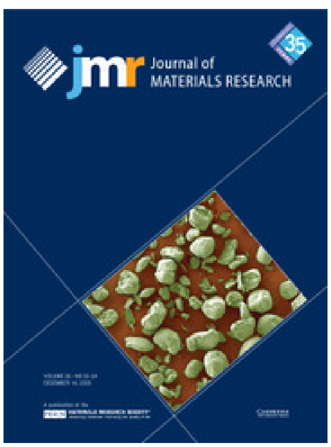

Journal of Materials Research

# Free boundary effects and representative volume elements in 3D printed Ti–6Al–4V gyroid structures

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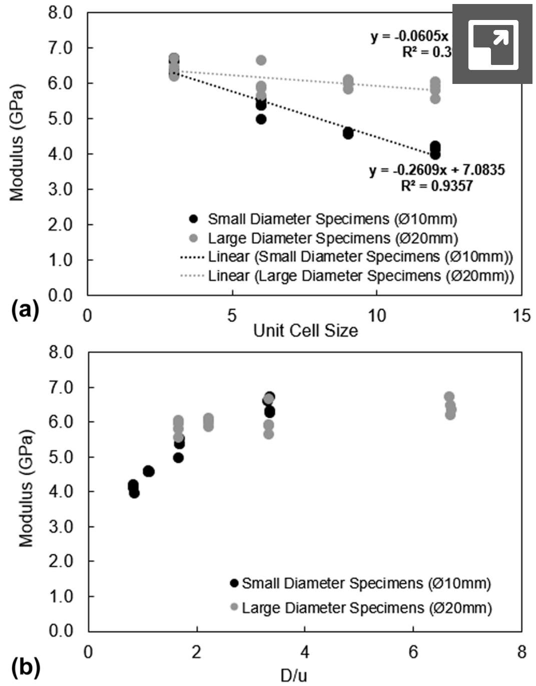
## Article contents



## Abstract




The adoption of selective laser melting (SLM) for fabrication of porous titanium has resulted in many new investigations into the complex design parameters associated with porous architecture of high spatial resolution. The development of meta-materials has included research into the effects of unit cell architecture (strut versus sheet), porosity, pore size, and other factors on the performance of metallic scaffolds. The current study examined the interactive effects of varying the gyroid sheet unit cell size and overall specimen size on the compressive behavior of Ti–6Al–4V ELI porous scaffolds manufactured via SLM. The increasing unit cell size relative to specimen geometry was found to decrease the compressive strength and stiffness of the overall structure and shift the material fracture mode. The understanding of the relationship between unit cell size and specimen geometry can be used to optimize mechanical properties of implants with constrained volumes and pore/wall size requirements to optimize properties of porous titanium implants for strength and osseointegration.

## Keywords

additive manufacturing

Ti

porosity

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