Functional and mechanical behavior of ultra-thin, porous NiTi fabricated via laser powder bed fusion

The Minerals, Metals & Materials Series

Motibane, Londiwe P
Council for Scientific and Industrial Research (CSIR)
Meiring Naude Drive, Pretoria, 0184
Email: LMotibane@csir.co.za

Nitinol shape memory alloys are used in a wide range of biomedical applications because of their biocompatibility, shape memory and superelasticity properties, and high corrosion resistance. Processing NiTi using additive manufacturing has led to even wider possibilities for use in the biomedical field. The focus of the study was on producing ultra-thin (±500 um strut), porous nitinol (NiTi) structures with varying levels of porosity using laser powder bed fusion (LPBF). Their functional and mechanical response was characterized. The effect of increased engineered porosity shifted the transformation temperatures higher and widened the hysteresis. As the amount of porosity increased, the compressive strength decreased as did the elastic modulus. The size and geometry of lattice unit cells were found to have a significant effect on the mechanical response of these porous structures. All the porous structures had an elastic modulus below 20 GPa. This low stiffness makes porous nitinol promising candidates for biomedical implants.