

Experimental Identification of the Yield Surface for Inconel Alloys Manufactured by Using Laser Engineered Net Shaping

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In this study, tubular specimens of Inconel 625 and Inconel 718 were additively manufactured using the Laser Engineered Net Shaping (LENS) technique (Fig.1a). Their initial yield surfaces were experimentally determined under biaxial stress loading at 0.005% and 0.01% plastic offset strain (Fig.1b). Uniaxial tensile tests showed yield strengths of 509 MPa and 461 MPa, with Young's moduli of 180 GPa and 171 GPa for Inconel 625 and Inconel 718, respectively. Yield surfaces, fitted using the Szczepiński anisotropic criterion, revealed elliptical shapes with axis ratios below 1.73, confirming moderate anisotropy. Inconel 625 exhibited nearly symmetric yield strengths in tension and compression, with a higher tensile-direction elongation of the surface, whereas Inconel 718 showed stronger directional dependence, reflecting a higher degree of mechanical anisotropy [1].

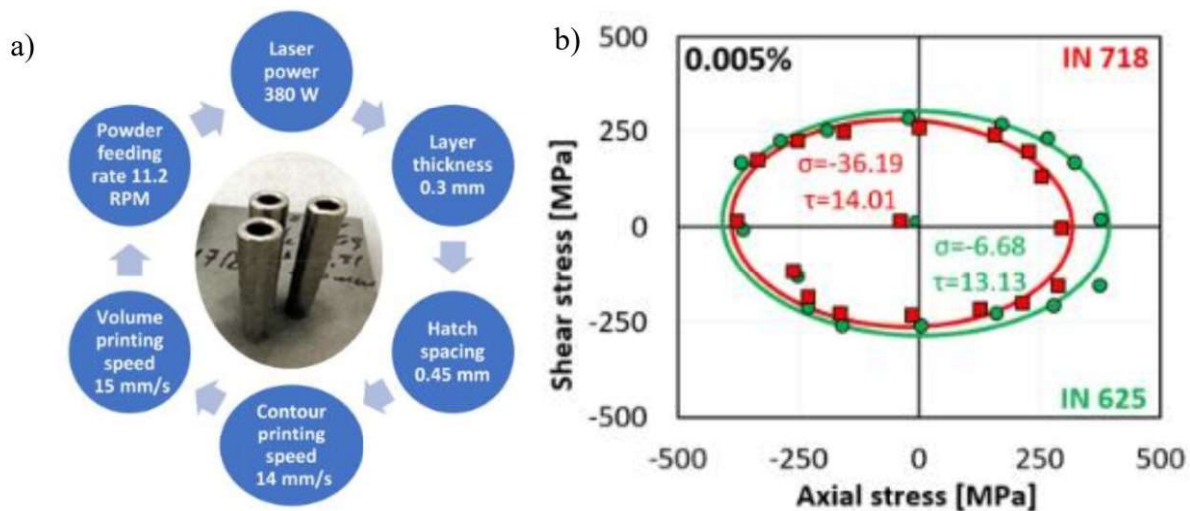


Figure 1. LENS process parameters with overview of the built plate with manufactured specimens (a); comparison of the yield surfaces of Inconel 625 and Inconel 718 for 0.005% plastic offset strain (b).

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