

Effects of laser shock peening on the mechanisms of fatigue short crack initiation and propagation of AA7075-T651

Sanchez, AG; You, C; Leering, M; Glaser, Daniel; Furfari, D; Fitzpatrick, ME; Wharton, J; Reed, PAS

**Abstract**

A laser shock peening (LSP) treatment was performed on AA7075-T651 for maximum fatigue improvement. Surface and microstructural characterisation techniques (micro-hardness, SEM-EBSD, contact-profilometry) showed LSP surface modification was limited, and LSP generated deep compressive residual stresses above - 300 MPa. Fatigue testing showed a two-order magnitude increase in overall life, due to the mechanism of crack initiation changing from surface second-phase particles to subsurface crack initiation dependent on the local stress field. Modelling highlights the sensitive balance between surface roughness (including LSP-induced pits) and residual stress on the micro-mechanism of crack initiation, and how this can be used to maximise fatigue life extension.