

Influence of cold compression on the residual stresses in 7449 forgings

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The aluminium alloy 7449 has very high compression strength and finds application, for example, as an aerospace upper wing skin alloy. Heat treatment includes cold water quenching from $470\pm 5^\circ\text{C}$. Rapid cooling from this solution treatment temperature leads to the development of thermal gradients, which in turn result in thermal stress driven plasticity. The plastic deformation is inhomogeneously distributed which ultimately results in residual stresses when the thermal gradients have dissipated. The through-thickness residual stress distributions within three large rectilinear 7449 forgings have been determined using neutron diffraction. Two neutron diffraction instruments were used, ENGIN-X at ISIS, UK and SALSA at ILL, France. Two of the forgings had been stress relieved by cold compression and had significantly lower residual stress than the as-quenched forging. The neutron diffraction results are compared to measurements made by the new incremental deep hole drilling technique.