Investigation of the correlation between mechanical chip morphology and surface residual stress for Ti6Al4V alloy

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Abstract

The numerical simulation analysis of mechanical chip morphology and residual stress for Ti6Al4V alloy was conducted under different cutting speed and feed rate. Johnson-Cook constitutive model and shear failure model were selected in simulation procedure. The correlations between the mechanical chip morphology and surface residual stress were detailed. The results show that the chip morphology characterized with the degree of serration *Gs* and the serrated frequency *f* has a direct impact on residual stress distribution. With the increase of the degree of serration *Gs*, the maximum residual tensile stress decreases, while with the increase of the serrated frequency *f*, the maximum residual compressive stress increases on the surface. The research of the present paper provides a new way to understand and evaluate residual stress distribution for titanium alloy mechanical process.

Keywords: Chip morphology, Residual stress, Ti6Al4V, Adiabatic shear band