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Modified Johnson-Cook Plasticity Model with Damage Evolution: Application to Turning Simulation of 2XXX Aluminium Alloy
(2017) *Journal of Mechanics*, pp. 1-12. Article in Press. Cited 5 times.

Abstract

Mechanical properties of the metals and their alloys are influenced by the material grain size at microscale. In the present study, the Johnson-Cook (JC) material model is modified to incorporate the effect of material's grain size along with the plasticity coupled damage model. 2D finite element (FE) simulations of turning process of an aerospace grade aluminium alloy 2024 (AA2024) were performed with different grain sizes using a commercial FE software, ABAQUS/Explicit. FE simulation results were compared with the published experimental data on turning process of AA2024. The proposed modified JC material model successfully simulated the increase in cutting force as a function of grain size refinement. Copyright © The Society of Theoretical and Applied Mechanics 2017

2-s2.0-85013447114

Document Type: Article in Press

Publication Stage: Article in Press

Source: Scopus

Access Type: Open Access