Abstract Submitted for the SHOCK11 Meeting of The American Physical Society

Evaluation of Five Fracture Models in Taylor Impact Fracture¹ WEI ZHANG, Hypervelocity Impact Research Center, Harbin Institute of Technology, XINKE XIAO, GANG WEI, ZITAO GUO — Taylor impact test presented in a previous study on a commercial high strength and super hard aluminum alloy 7A04-T6 are numerically evaluated using the finite element code ABAQUS/Explicit. In the present study, the influence of fracture criterion in numerical simulations of the deformation and fracture behavior of Taylor rod has been studied. Included in the paper are a modified version of Johnson-Cook, the Cockcroft-Latham(C-L), the constant fracture strain, the maximum shear stress and the maximum principle stress fracture models. Model constants for each criterion are calibrated from material tests. The modified version of Johnson–Cook fracture criterion with the stress triaxiality cut off idea is found to give good prediction of the Taylor impact fracture behavior. However, this study will also show that the C-L fracture criterion where only one simple material test is required for calibration, is found to give reasonable predictions. Unfortunately, the other three criteria are not able to repeat the experimentally obtained fracture behavior. The study indicates that the stress triaxiality cut off idea is necessary to predict the Taylor impact fracture.

¹The National Natural Science Foundation of China (No.: 11072072)

Wei Zhang Hypervelocity Impact Research Center, Harbin Institute of Technology

Date submitted: 23 Feb 2011

Electronic form version 1.4