

Size Effects in Thin Sheet Metal Forming and its Elastic-Plastic Constitutive Model

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Abstract

Size effects make most know-how of traditional macro-forming not suitable for the micro-forming process. Material behaviour greatly varies in micro-sheet forming process with different sheet thickness. This paper's purpose is to establish a uniform constitutive model considering size effects in micro-forming process. On the basis of the uniaxial tension experiment of the CuZn36 sheet, a uniform double-linear constitutive equation which is suitable for any thickness of the sheet metal is put forward. Moreover an algorithm of the VUMAT-subroutine for this constitutive model is given. By use of the constitutive model and the VUMAT-subroutine, the forming process of the micro-U shape are simulated, and the simulation results show that the constitutive model proposed by this paper can precisely describe the flow behaviour of the micro-sheet metal.

Key Words : Size effects; Constitutive model; Micro-forming; Elastic-plastic