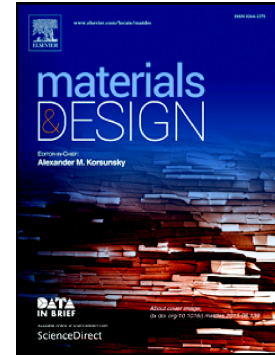


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Robust multi objective optimization of anisotropic yield function coefficients

Kaushik Bandyopadhyay¹, Krishnaswami Hariharan², Myoung-Gyu Lee^{3*}, Qi Zhang⁴

¹Department of Material Science and Engineering, Korea University, 145 Anam-Ro, Seongbuk-Gu, Seoul 136-701, Korea

²Department of Mechanical Engineering, IIT Madras, Chennai 600-036, India

³Department of Material Science and Engineering, Seoul National University, Seoul 08826, Korea

⁴ School of Mechanical Engineering, Xi'an Jiaotong University, Xianning West Road, Xi'an, Shaanxi 710049, PR China

*Corresponding author: myounglee@snu.ac.kr

Abstract: The coefficients of yield functions have been conventionally determined based on limited number of experiments such as yield stresses and/or R-values along different material orientations. In the present study, a multi objective genetic algorithm (MultiGA) based approach was implemented to obtain coefficients of anisotropic yield functions by simultaneous error minimization for yield stresses and R-values. Three frequently employed yield functions, Hill 1948, Barlat 1989 and Barlat Yld2000-2d, in the sheet metal forming simulations were considered. The performance of the determined coefficients for each yield function was judged by comparing the predicted yield stress and R-values with experimental values. Fundamental questions regarding the effect of experimental data on determining the coefficients were analyzed using the proposed approach. It is generally perceived that increase in experimental data enhances the accuracy of the determination of coefficients. Some counter intuitive results obtained on this regard is discussed. Finally, finite element (FE) simulations were performed to predict earing profile in deep drawn cups and springback profile for split-ring test, which were validated with experimental results. From the comparative study with conventional method and experiment, the yield function coefficients optimized by the MultiGA performed well for predicting the deformation behaviors of various anisotropic sheet metals.

Key words: anisotropy; genetic algorithm; sheet metals; springback; formability; finite element simulation

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