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Shun-Peng Zhu, Zheng-Yong Yu, José Correia, Abílio De Jesus, Filippo Berto

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## Evaluation and comparison of critical plane criteria for multiaxial fatigue analysis of ductile and brittle materials

Shun-Peng Zhu<sup>1,2,\*</sup>, Zheng-Yong Yu<sup>1</sup>, José Correia<sup>3</sup>, Abílio De Jesus<sup>3</sup>, Filippo Berto<sup>4</sup>

<sup>1</sup>*School of Mechanical and Electrical Engineering, University of Electronic Science and Technology of China, Chengdu 611731, China*

<sup>2</sup>*Department of Mechanical Engineering, Politecnico di Milano, 20156 Milan, Italy*

<sup>3</sup>*INEGI, Faculty of Engineering, University of Porto, Porto 4200-465, Portugal*

<sup>4</sup>*Department of Mechanical and Industrial Engineering, Norwegian University of Science and Technology, 7491 Trondheim, Norway*

(Revised portion are underlined in blue)

**Abstract:** This paper conducts a comparative evaluation on typical critical plane criteria, including Fatemi-Socie, Wang-Brown, modified Smith-Watson-Topper (MSWT) and proposed modified generalized strain energy (MGSE) criteria for multiaxial fatigue analysis of ductile/brittle materials. Experimental datasets of four materials under uniaxial tension, torsion and proportional/non-proportional multiaxial loadings are introduced for model comparison. This study results indicate that criteria with additional material constants yield robust life predictions for different materials. Moreover, the criteria with shear and uniaxial fatigue properties are respectively suitable for ductile and brittle materials, particularly the MGSE superior to others for ductile/brittle materials while MSWT only for brittle materials.

**Keywords:** multiaxial fatigue; critical plane; strain energy; life prediction; damage parameter

### Nomenclature

$\sigma_{n,max}$	Maximum normal stress on the critical plane	$G$	Shear modulus
$\sigma_f'$	Fatigue strength coefficient	$\sigma_{n,mean}$	Normal mean stress on the critical plane
$\varepsilon_f'$	Fatigue ductility coefficient	$\tau_{max}$	Maximum shear stress on the critical plane

<sup>1</sup>Corresponding author. E-mail address: [zspeng2007@uestc.edu.cn](mailto:zspeng2007@uestc.edu.cn) (S.P. Zhu)

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