Experimental Evaluation of Ductile Fracture of Sheet Metals under Plane Stress States

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Abstract

The four variables Mohr-Coulomb model was established to study the ductile fracture of metal sheets under plane stress states. Beginning with the recorded minor and major strain distributing on the deformation area of uniaxial tension samples, a series of key parameters relative to the M-C model, including strain ratio, stress triaxiality, Lode angle parameter and equivalent strain during all the loading period have been studied for their inherent relationship, by utilizing Moving Regression algorithm. Then the determined M-C model could be described as the function of equivalent ultimate strain against the stress triaxiality. In the present study, three types of samples including 0° pure shear, 45° shear-tension and regular tension were testified suitable to numerically resolve the W-shaped M-C curve. M-C model and its transformed curve constructed in the minor/major strain Cartesian-coordinate could extend the conventional FLC into the field of shear loading, providing a guide to assess the material resistance against the ductile failures under various plane stress conditions.

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