Damage Evolution in Aluminium Alloy 2011 Wires Drawn Under Different Geometrical Configurations

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ABSTRACT

Wire production is carried out by means of a plastic forming process called drawing, which reduces the cross-section of the material by pulling it through a rigid die to induce plastic deformations in the material. During this process, it is possible to find faults that start within the material and can only be seen when the drawn wire breaks. This kind of defect (known as "central burst") correspond to a ductile fracture [1]. The present work analyses the damage evolution in the drawing process of aluminium alloy 2011 wires under different geometrical configurations (5 die angles and 4 reduction levels), using a coupled model of ductile fracture (Lemaitre's model [2]). The characterization of the model is carried out by load-unload tensile tests, with the intention of capturing the degradation of the elastic module product of the damage experienced by the material. In order to evaluate the ability of the model to predict the fracture in the drawing process, the numerical results are compared with experiments also made in the context of this work.

REFERENCES

[1] B. Avitzur, *Handbook of Metal-Forming Processes*, John Wiley and Sons, New York, USA 1983.

[2] J. Lemaitre, "A continuous damage mechanics model for ductile fracture" *Journal of Engineering Materials and Technology*, **107**, 83-89 (1985).