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Prediction of fracture in a dual-phase steel subjected to non-linear straining

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Abstract

In this work, selected fracture criteria are applied to predict the fracture of dual-phase steel subjected to non-linear strain paths. Furthermore, the effects of manufacturing history are studied. Four fracture criteria were calibrated in three tests using standard specimens. The fracture criteria were first validated in the circular Nakajima test. A second validation test case was included in order to validate fracture prediction for non-linear strain paths. In this test a sheet metal component was manufactured and subsequently stretched until it fractured. All fracture criteria included in this study predict fracture during the Nakajima test with reasonable accuracy. In the second validation test however, the different fracture criteria show considerable diversity in accumulated damage during manufacturing which caused substantial scatter of the fracture prediction in the subsequent stretching. This shows that manufacturing history influences the prediction of fracture.

Keywords: sheet metal failure, high strength steels, forming limits, non-linear strain paths, forming history

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