

## **An Investigation of Lode Effects on Ductile Fracture**

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### **Abstract**

Ductile fracture is affected by the state of stress, which is commonly described by two parameters, stress triaxiality and Lode parameter. While the effects of triaxiality are well known, the effect of the Lode parameter are uncertain. This uncertainty results in particular from the difficulty to vary the Lode parameter at controlled triaxiality. Recent experiments by the authors suggest that the Lode parameter does indeed affect ductile fracture to some extent. The aim of this work is to analyze the mechanisms behind these apparent effects of the Lode parameter. To accomplish this, an advanced multi-surface porous-plasticity model that accounts for both homogeneous and inhomogeneous yielding is used in an Abaqus Umat to simulate proportional loading of a single integration point. Within this modeling framework, the effect of Lode parameter is inherently captured through the competition between the two main modes of inhomogeneous yielding: internal necking and internal shearing of the intervoid ligament. The ability of this constitutive formulation to capture the effects of the Lode parameter that were observed in experiments is examined.