

Title: Stress intensity factor and plastic zone of auxetic materials: A fracture mechanics approach to a chiral structure having negative Poisson's ratio

Author/Authors: Yunan Prawoto, Amran Alias

Abstract: This article summarizes the method of analytical formulation and computational approach of stress intensity factor and plastic zone calculation for auxetic materials, which have negative Poisson's ratio. A chiral structure-based material is selected as an object of the study due to its popularity. The stress intensity factor is used in combination with the von Mises yielding condition to estimate the plastic zone's shape and size. The results show that macroscopically the shape of the plastic zone for auxetic material is the same with that of ordinary materials. However, its size is smaller due to the reduction in its Young's modulus from the solid material of which the auxetic material is made. Microscopically, an auxetic material has its plastic zone shape that is unique to its microstructure. Homogenization theory was convenient to use to bridge between the microscopic and macroscopic models.