

ABSTRACT

In the field of fracture mechanics, the stress intensity factors for mode I and mode II are crucial for assessing the failure of structural components. Until now, it has been impossible to estimate the pure modes I and II fracture toughness in orthotropic materials for arbitrary crack-fiber angles. The objective of this study is to design an appropriate specimen that allows for any combination of mode mixity. Wooden specimens are considered excellent for studying the fracture behavior of orthotropic materials. These specimens are natural composites reinforced with fibers. In this context, the new center-notched disk tension specimen has been worked out to create different loading conditions from pure mode I to pure mode II by changing the crack-fiber angle and crack-loading configuration. A comprehensive study has been performed regarding the influence of the crack-fiber orientation and crack-loading direction on the stress intensity factors. Analytical relationships for the stress intensity factors in modes I and II are proposed for arbitrary crack-fiber angle conditions.

Q KEYWORDS: Wood stress intensity factors (SIF) orthotropic materials finite element method mode II fracture toughness