

Abstract

This research studies stress intensity factor KI and KII of composite material in 2 dimensions by adaptive finite element method and the Photoelasticity technique. The result is crack – inclusion interaction. This thesis presents the development of composite material, optical theory and Photoelasticity technique, finite element method in linear fracture mechanics using Q8, Q4 and T3 element types. The adaptive remeshing technique is applied to increase computational accuracy.

Then both methods are validated by three examples i.e. single edge crack plate tension problem, slant cracked 30° rectangular plate and slant cracked 45° rectangular plate. All specimen are made from PS-1 polycarbonate (matrix) and reinforcement with magnesium alloy AZ61 (hard inclusion) or Teflon (soft inclusion). The solution shows that the stress intensity factor of hard inclusion is less than stress intensity factor of soft inclusion, which have good agreements with experimental results of Photoelasticity technique.