ABSTRACT

A stress intensity factor K was used as a fracture parameter to determine the true material property, i.e. plane strain fracture toughness KIC of AZ61 magnesium alloy using a single edge notch bend (SENB) specimen in accordance to ASTM E399 testing method. Five different specimen thicknesses of 2 to 10 mm were used in the test. A sharp fatigue pre-crack was initiated and propagated to half of specimen width at a constant crack propagation rate of about 1 x 10-8 m/cycle before the specimen was loaded in tension until the fracture stress is reached and then rapid fracture occurred. The fracture toughness KC values obtained for different thicknesses showed that KC value decreased with increasing specimen thickness. The highest KC value obtained was 16.5 MPa√m for 2 mm thickness specimen. The value of KC became relatively constant at about 13 MPa√m when the specimen thickness exceeds 8 mm. This value was then considered as the plane strain fracture toughness KIC of AZ61 magnesium alloy. Calculation of the minimum thickness requirement for plane strain condition and the size of the shear lips of the fracture surface validate the obtained KIC value.

Keywords: Stress intensity factor, fracture toughness, thickness, shear lips, magnesium alloy