K.J. Wong is an Associate Professor at Department of Mechanical Engineering, Faculty of Engineering and Science, Curtin University Malaysia. He received his Bachelor of Engineering (Hons.) Mechanical from Multimedia University, Malaysia in 2004 with first class honours, Master of Engineering (Mechanical) from Universiti Teknologi Malaysia in 2006 and PhD in Mechanics from Institut Supérieur de l'Automobile et des Transports (ISAT), France in 2013. He is a Chartered Engineer of Engineering Council, Chartered Member of Institution of Mechanical Engineers (IMechE), Fellow at Higher Education Academy (HEA), Senior Graduate Member of The Institution of Engineers, Malaysia; and Graduate Engineer of Board of Engineers Malaysia (BEM). His research interests include durability of engineering materials, adhesive joints, delamination of composite laminates and computational solid mechanics. He has led and served as co-investigator for over 35 major research projects with total research grant of over MYR 3.5million and produced over 90 journal and conference publications as well as book chapters to date.

Effects of Moisture Absorption on the Different Modes of Carbon/Epoxy Composites Delamination: Experiments and Mode I Fibre Bridging Modelling

Abstract

This presentation focuses on the water absorption effects on the delamination of carbon/epoxy composites. The specimens were immersed in distilled water at constant 70 °C and tested at various water absorption levels using mode I, mode II and mixed-mode I/II loading configurations. Experimental results revealed that mode I fracture toughness was insensitive to the moisture attack. However, approximately 50% drop in mode II and mixed-mode I/II fracture toughness were observed at high moisture content levels. The variation of fracture toughness with both mode ratio and moisture content was further characterised using a newly proposed three-dimensional criterion. Upon water exposure, fractured surfaces were also found to possess a more porous matrix with a more significant fibre/matrix interface debonding. Not only that, fibre bridging was observed in all mode I wet specimens with an increment of up to 60–100% in fracture energy. A Bilinear-Exponential Traction-Separation (BETS) law that considered fibre bridging mechanism was thus proposed. Through finite element (FE) simulations, it was found that both numerical force-displacement curve and crack length agreed well with results from experimental study The FE

model also predicted that the crack extension increases linearly with increasing crosshead displacement.