Title: Re-examination of thermal residual stress effects on interfacial properties of thermoplastic matrix micro-bond test

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Abstract  
As a result of manufacturing processes, thermal residual stresses often occur in fibre reinforced polymer composites and affect the fibre/matrix interface properties, e.g., interfacial shear strength (IFSS), which is commonly evaluated by the microbond test. In thermoplastic matrices, thermal residual stresses can be relieved by annealing. In this talk, we re-examine the effects of thermal residual stresses on IFSS and post-debond friction stress using an example of polyphenylene sulfide/carbon fibre (PPS/CF) composite. Microbond tests on both air-quenched (control) and annealed samples are conducted. By comparing the pullout results of the control to the annealed samples subjected to six different annealing temperatures between 80 oC and 230 oC, it is found that the thermal
residual stresses in the fibre axial and radial directions are reduced progressively below 120 oC and can be neglected above this temperature. Thermal residual stresses in the fibre direction can be calculated to explain the microbond test results and construct a master curve for the IFSS. Post-debonding friction stresses can also be analysed in terms of the calculated fibre radial thermal residual stresses and debonded fibre morphologies.

Short biography

Professor Yiu-Wing Mai received his undergraduate and postgraduate training in mechanical engineering at the University of Hong Kong, China. He worked previously in the US (University of Michigan and the NIST), the UK (Imperial College) and Hong Kong (CityU, HKU, HKUST and PolyU); and now holds a University Chair in Mechanical Engineering at the University of Sydney.

Prof Mai has made seminal contributions on fracture mechanics and advanced composite materials. His research results have impacted on the developments of asbestos-free fibre cements, testing protocols for essential work of fracture of polymers, and improved composites manufacturing processes. Prof Mai was appointed AM (Order of Australia) in 2010 and is Fellow of the Royal Society, the Royal Academy of Engineering, the Australian Academy of Science, and the Australian Academy of Technological Sciences and Engineering.

ALL INTERESTED ARE WELCOME

For further information, please contact Dr. M.X. Huang at 2859 7906.