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Comparison of fracture behavior between acrylic and epoxy adhesives

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Abstract

An experimental study was conducted on the strength of adhesively bonded steel joints, prepared epoxy and acrylic adhesives. At first, to obtain strength characteristics of these adhesives under uniform stress distributions in the adhesive layer, tensile tests for butt, scarf and torsional test for butt joints with thin-wall tube were conducted. Based on the above strength data, the fracture envelope in the normal stress-shear stress plane for the acrylic adhesive was compared with that for the epoxy adhesive. Furthermore, for the epoxy and acrylic adhesives, the effect of stress triaxiality parameter on the failure stress was also investigated. From those comparison, it was found that the effect of stress tri-axiality in the adhesive layer on the joint strength with the epoxy adhesive differed from that with the acrylic adhesive. Fracture toughness tests were then conducted under mode l loading using double cantilever beam (DCB) specimens with the epoxy and acrylic adhesives. The results of the fracture toughness tests revealed continuous crack propagation for the acrylic adhesive, whereas stick-slip type propagation for the epoxy one. Finally, lap shear tests were conducted using lap

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