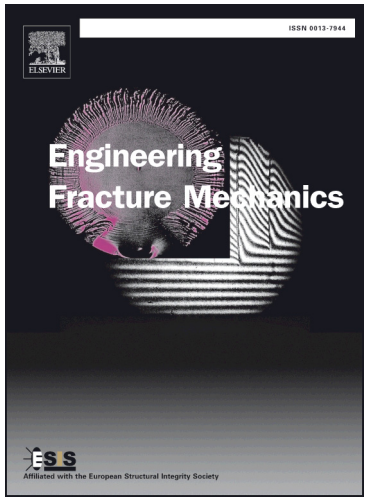

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Characterization of aluminium one-component polyurethane adhesive joints as a function of bond thickness for the automotive industry: Fracture analysis and behavior

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Abstract

The automotive industry is increasing, nowadays, its use of high performance structural adhesives in order to reduce vehicle weight and increase the crash resistance of automotive structures. One-component polyurethane adhesives are attracting rising interest as an alternative to conventional rigid structural adhesives. This is due to several benefits such as the excellent impact resistance they provide. This paper investigates experimentally the mechanical behavior of one-component polyurethane adhesive joints and specifically the effect of the adhesive layer to be used in several parts for buses structure. Furthermore, it characterizes the fracture behavior of the adhesive layer with various bond's thicknesses using mode-I and mode-II fracture testing. The fracture toughness under both modes is determined using Double Cantilever Beam (DCB) and End-Notched Flexure (ENF) tests, respectively. Assessment of the various fracture tests indicated that DCB and ENF provide the same shape of evolution of the fracture energy versus adhesive thickness. Moreover, the test results were able to fully mechanically characterize the adhesive and demonstrate that the adhesive has not only high mechanical strength but there is an optimal adhesive thickness, which allows a high toughness for bonded joints. This result proves that it is worthy to use the one-component polyurethane adhesive in the automotive industry.