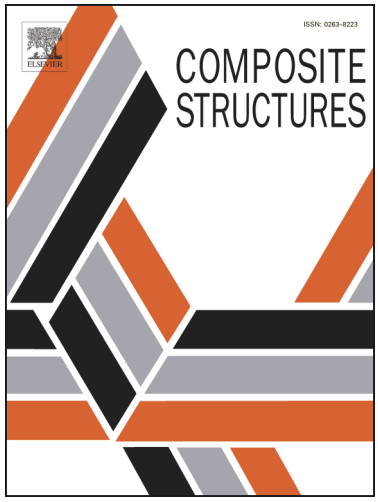

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A novel metal-composite joint and its structural performance

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Abstract

A novel joining method between metallic and composite structures was developed to enhance the mechanical performance of metal-composite hybrid structures. According to this joining method, the metallic and composite components are adhesively bonded together and there are also some thin pins in the overlap region running through the joint plates. The pins are bonded together with the joined components as well. Comparatively tensile tests were conducted on the metal-composite joints so as to investigate the advantages of the proposed joining method. The load-displacement relationships, fracture modes and fatigue life were analyzed in accordance with the test results of the two different types of joints. The results show that the proposed joining method can improve ultimate failure load, failure displacement, energy absorption capacity and fatigue life significantly. Furthermore, the novel joining method decreases the suddenness of the failure of the joint and provides some plastically like behavior to the joint. Finite element models were developed to investigate the enhancement mechanism of the proposed method. Through the analysis of the failure process, it can be concluded that there are bridging force between the pins and the jointed components and the bridging force not only transfers load between the components together with the adhesive layer, also inhibits the adhesive layer from peeling.

Keywords: Adhesive-multi pin joint; Composite-to-metal; Tensile test; Finite element analysis; Failure