

Analysis of Single Lap Functionally Graded Adhesive Joints with Different Adherends

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Abstract. Adhesively bonded joint is one of the most widely used joining structures in aerospace, ships, automobiles, energy and other fields in recent years. It has low manufacturing cost and structural weight than the traditional joining techniques [1]. The performance evaluation and influencing factors of adhesive joints are always important in this field. When two different materials are joined by adhesive, the interfacial stress distribution along the direction of the bonding line is not uniform, and the higher stress concentration at the end of the interface often becomes the reason for the failure point of the joint [2-4]. The mixed adhesive joint and Functionally Graded Adhesives (FGAs) are utilized to reduce the stress concentrations at the edges of the adhesive layer and improve the joint strength [5,6]. This study investigated the improvement of bonded joint strength by hybrid adhesives using Finite Element Method (FEM). The adherends are aluminum, steel and carbon/epoxy composite and the adhesives are epoxy with different elastic moduli. It has been shown that the improvement of the joint strength is also affected by different adherends. For the joints with different combinations of adherends, the application of FGA show different decrease in stress concentration and increase in strength.

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