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Failure Load Investigations in Adhesively Bonded Single-Strap Joints of Dissimilar Materials Using Cohesive Zone Model

Authors : B. Paygozar, S.A. Dizaji

Abstract : Adhesive bonding is a highly valued type of fastening mechanical parts in complex structures, where joining some simple components is always needed. This method is of several merits, such as uniform stress distribution, appropriate bonding strength, and fatigue performance, and lightness, thereby outweighing other sorts of bonding methods. This study is to investigate the failure load of adhesive single-strap joints, including adherends of different sizes and materials. This kind of adhesive joint is very practical in different industries, especially when repairing the existing joints or attaching substrates of dissimilar materials. In this research, experimentally validated numerical analyses carried out in a commercial finite element package, ABAQUS, are utilized to extract the failure loads of the joints, based on the cohesive zone model. In addition, the stress analyses of the substrates are performed in order to acquire the effects of lowering the thickness of the substrates on the stress distribution inside them to avoid designs suffering from the necking or failure of the adherends. It was found out that this method of bonding is really feasible in joining dissimilar materials which can be utilized in a variety of applications. Moreover, the stress analyses indicated the minimum thickness for the adherends so as to avoid the failure of them.

Keywords : cohesive zone model, dissimilar materials, failure load, single strap joint
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