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Multi-Material Adhesive Joints for Automotive Industry

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Abstract

The application of adhesively bonded joints in automotive industry has increased significantly in recent years mainly because of the potential for lighter weight vehicles, fuel savings, and reduced emissions. The principal benefits are design flexibility and joining of dissimilar and/or new materials, among others. On the other hand, the use of lightweight materials such as high strength steel, aluminum alloys as well as composites in making automotive body components to achieve a reduced vehicle mass has also continuously increased. In this paper, similar and multi-material adhesive joins were investigated experimentally and numerically. Several important factors, such as overlap length and adherend stiffness, influencing the strengths of multi-material adhesive joints were investigated. It was found that, for relatively short overlaps in SLJs bonded with structural modern tough adhesives, failure is dominated by adhesive global yielding and the influence of geometry and/or material combination on joint strength is not significant. Overall numerical values of the maximum load were very close to experimental results, validating the numerical methodology to predict the lap shear strength and providing the necessary data to explain the obtained behaviour.

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