



Tensile-Shear Properties of Dissimilar Adhesive Joints between Aluminum and Stainless Sheets and Effect of Aluminum Sheet Thickness

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Abstract

The application of adhesively-bonded joints in automotive body has increased for reducing the weight body components. Especially, adhesive bonding is used for the joining of dissimilar materials, such as Aluminum (Al), steel, CFRP, etc, where multi-material car body concept is integrated. However, tensile-shear properties of dissimilar adhesive joints are not well understood. In the present study, stainless steel sheets were adhesively bonded to Al sheets with three different thickness to fabricate lap-shear specimens. Tensile shear tests were conducted to investigate the effect of Al sheet thicknesses, namely the effect of bending stiffness of Al sheets, on the joint properties. It was found that the maximum tensile shear loads were nearly the same irrespective to the Al sheet thicknesses. However, the fracture mode transition was recognized. The fracture through the adherent (cohesive fracture) was dominant when the Al was thick, but interface failure between Al sheets and adherent became frequent with decreasing Al sheet thicknesses. It is considered that the change of bending stiffness in Al sheets led to the transition of fracture mode. Tensile shear fracture started at the edge of adherent under tensile loading, where fracture location was well predicted by a FEM calculations.

Keywords: Adhesive joint, Dissimilar joint, Aluminum, Steel, Tensile-shear property