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Prediction of Fatigue Crack Propagation in Bonded Joints Using Fracture Mechanics

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Abstract : Fracture Mechanics is used to predict debonding propagation in adhesive joint between aluminum and composite plates. Three types of loadings and two types of glass-epoxy composite sequences: [0/90]2s and [0/45/-45/90]s are considered for the composite plate and their results are compared. It was seen that generally the cases with stacking sequence of [0/45/-45/90]s have much shorter lives than cases with [0/90]2s. It was also seen that in cases with λ=0 the ends of the debonding front propagates forward more than its middle, while in cases with λ=0.5 or λ=1 it is vice versa. Moreover, regardless of value of λ, the difference between the debonding propagations of the ends and the middle of the debonding front is very close in cases λ=0.5 and λ=1. Another main conclusion was the non-dimensionalized debonding front profile is almost independent of sequence type or the applied load value.

Keywords : fatigue, debonding, Paris law, APDL, adhesive
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