

Effect of the Amount of Adhesive on the Bending Fatigue Strength of Adhesively Bonded Aluminum Honeycomb Sandwich Beams

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Abstract

The effect of the amount of adhesive for bonding face sheets and cores on the bending fatigue strength of aluminum honeycomb sandwich beams was analyzed. It was experimentally proved that the fatigue strength increases as increasing the amount of adhesive. Furthermore, the applied loading parameter is not correlated with the fatigue life data of all studied specimens with various amounts of adhesive because the global parameter has no clear physical meanings with respect to the failure mechanism. From the observations made during fatigue testing, debonding at the interface between the honeycomb core and face sheet is the main cause of fatigue failure. Finite element analyses were conducted to obtain the local stress states at the interface, and these simulated stresses were employed in fatigue life prediction parameters. Three local interfacial parameters were adopted and correlated with the experimental data for the studied specimens. The predicted failure locations using the three interfacial parameters were also examined by comparing the observation results in fatigue tests. Among the three studied interfacial parameters, the combined interfacial peeling and

shear stress

parameter is recommended for use in fatigue design as it provides good fatigue life

correlations and predicts the correct locations of failure initiation simultaneously.

Keyword : Honeycomb, Sandwich beam, Amount of adhesive, Fatigue, Debonding, Finite element analysis.