

Effect of Thickness of Face Sheet on the Bending Fatigue Strength of Aluminum Honeycomb Sandwich Beams

任貽明, 張立言

Mechanical Engineering

Engineering

ymjen@chu.edu.tw

Abstract

Three types of aluminum honeycomb sandwich beam specimens with different face sheet thicknesses were employed in the four-point bending fatigue tests to study the effect of face sheet thickness on the fatigue strength. The experimental results show that under the same applied bending loads, no evident relationships exist between the face sheet thickness and the fatigue life of the studied specimens. The main failure mode of the studied specimens is the debonding at the interface between the adhesive and the face sheet based on the observations during the tests. To correlate with the scattering fatigue life data of the studied specimens with different face sheet thicknesses by using the local approaches, three parameters based on the finite element simulated interfacial stresses were proposed herein. The sub-modeling technique was applied in the finite element simulations to determine the local interfacial stresses. The employed local parameters in the study were the interfacial peeling stress, the in-plane interfacial shear stress, and the linear combination of interfacial peeling and shear stress. The comparison of the correlation performance between these employed parameters was made in the

study.

Furthermore, the nodes with the maximum value of prediction parameters were considered as the potential locations where the debonding failure initiated. The predicted locations of debonding initiation obtained using the three parameters were also compared with the observed ones. The analytical results show that the linearly combined peeling and shear stress parameter yields better fatigue-life correlation and failure-location prediction results than the other two parameters.

Keyword : Honeycomb sandwich beam, Fatigue, Debonding, Finite element analysis, Interfacial stress.