Mixed-mode fracture evaluation of aerospace grade honeycomb core sandwich specimens using the Double Cantilever Beam–Uneven Bending Moment test method

Fracture testing of aerospace grade honeycomb core sandwich composites is carried out using the Double Cantilever Beam specimen loaded with Uneven Bending Moments, and a Double Cantilever Beam–Uneven Bending Moment test rig capable of applying pure moments is utilized. Specimens with carbon fiber-reinforced plastic face sheets are employed with a range of honeycomb core grades comprising of Nomex® and Kevlar paper. The sandwich specimens are reinforced with steel doublers to reduce excessive rotation of the face sheets. The mode mixity phase angle pertaining to a particular ratio of moments between the two arms of the Double Cantilever Beam specimen is determined using the numerical mode mixity method—Crack Surface Displacement Extrapolation method. For Nomex® honeycomb core sandwich specimens, it is observed that the mode I interface fracture toughness increases with increase in core density. The interface fracture toughnesses for Nomex®-based honeycomb cores are also compared against specimens with Kevlar paper-based honeycomb cores. Crack propagation is observed at the interface just beneath the meniscus layer for the majority of the tested specimen configurations. The Double Cantilever Beam–Uneven Bending Moment test methodology with the concept of direct application of moments on both crack flanks has proven to have a significant potential for mixed mode face/core fracture characterization of aerospace grade sandwich composites.