

ABSTRACT

Beetles adaptability helps this ancient species to escape extinction. The beetles' robust body construction is the physical effect of the development process, which enhances this insect's success capacity. Human beetles are distinct, consisting of forewings and hind wings. Forewings are layers of light and solid wings, covering the hind legs under them. The forewings framework encourages a lightweight system known as the Beetle Forewing Sandwich Structure (BFS). The BFS structure relates to the existing honeycomb sandwich structure with additional trabecula structure at different hexagonal wall sites. Previous studies have demonstrated this structure's remarkable mechanical performance over conventional lightweight structure (e.g. hexagonal plate) in BFS. An enhancement analysis will be carried out in the present study with multi-factor experimental design to refine the BFS structure function, intending to suggest a BFS framework of greater strength but less weight with the used of Aluminium 6061 Alloy (UNS A96061). The results of this study may eventually contribute to the alternative lightweight structure for many engineering applications, notably the load-bearing products.

Keywords—Beetles Adaptability, Beetle Forewing Sandwich Structure, Existing Honeycomb Sandwich Structure, Enhancement Analysis, Lightweight Structure