

Fabrication and Analysis of Simplified Dragonfly Wing Structures Created Using Balsa Wood and Red Prepreg Fibre Glass for Use in Biomimetic Micro Air Vehicles

Authors : Praveena Nair Sivasankaran, Thomas Arthur Ward, Rubentheren Viyapuri

Abstract : Paper describes a methodology to fabricate a simplified dragonfly wing structure using balsa wood and red prepreg fibre glass. These simplified wing structures were created for use in Biomimetic Micro Air Vehicles (BMAV). Dragonfly wings are highly corrugated and possess complex vein structures. In order to mimic the wings function and retain its properties, a simplified version of the wing was designed. The simplified dragonfly wing structure was created using a method called spatial network analysis which utilizes Canny edge detection method. The vein structure of the wings were carved out in balsa wood and red prepreg fibre glass. Balsa wood and red prepreg fibre glass was chosen due to its ultra- lightweight property and hence, highly suitable to be used in our application. The fabricated structure was then immersed in a nanocomposite solution containing chitosan as a film matrix, reinforced with chitin nanowhiskers and tannic acid as a crosslinking agent. These materials closely mimic the membrane of a dragonfly wing. Finally, the wings were subjected to a bending test and comparisons were made with previous research for verification. The results had a margin of difference of about 3% and thus the structure was validated.

Keywords : dragonfly wings, simplified, Canny edge detection, balsa wood, red prepreg, chitin, chitosan, tannic acid

Conference Title : ICMAAE 2015 : International Conference on Mechanical, Aeronautical and Automotive Engineering

Conference Location : Singapore, Singapore

Conference Dates : July 04-05, 2015