Paper ID: 88955
oral

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Interactive Presentations - IAF MATERIALS AND STRUCTURES SYMPOSIUM (IPB)

Author: Prof. Fabricio Ortíz
National Autonomous University of Honduras, Honduras

BIO-BASED MATERIALS, THE OLD NEW FOR MORE SUSTAINABLE AND HIGH-PERFORMING SPACE STRUCTURES.

Abstract

The new space economy will see an increased number of space objects orbiting the earth and it comes with many concerns about space junk generation, complete burning at re-entry and sustainability aspects of this new growing sector. As many industries have started to look at more ecofriendly materials, this paper explores the structural efficiency, thermal performance, and sustainability aspects of bio-based materials i.e. wood, bamboo, and cork as promising old acquaintances for space structures in short life-cycle mission like CubeSats. Taking as a basis, the chassis design of MRZ-SAT, winner of the 5th Kibo Cube round, this work elaborates on the material performance indices derived from Ashby charts considering mass, stiffness, strength, fractures toughness and fatigue under space operation temperatures. Moreover, considers thermal conductivity, as well as the influence of different structural configurations through trade-off plots. The sustainability aspects are benchmarked though a Life Cycle Assessment analysis that yield the embodied carbon (CO2 footprint) for all the possible configurations and buildability of the bio-based options are explored using a CNC-router. Keywords: Materials' Selection, Bio-based Materials, CubeSats, Thermal, Structures.