

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Advancements in Materials Applications and Rapid Prototyping (5)

Author: Mr. Pedro Alves
University of Brasilia, Brazil, pedrohenriquedf11@gmail.com

Mr. Mateus Sant'Ana
University of Brasilia, Brazil, mateus.s.santana.1@gmail.com

Mr. João Victor Moreira
University of Brasilia, Brazil, 190046571@aluno.unb.br
Prof.Dr. Manuel Nascimento Dias Barcelos Júnior
Universidade de Brasília, Brazil, manuelbarcelos@unb.br

SANDWICH STRUCTURES WITH TPMS GRADED-CELLS CORE ARCHITECTURE

Abstract

Triply Periodic Minimal Surfaces (TPMS) are structures that can be periodically extended in three directions. They are non-self-intersecting mathematically based surfaces discovered in the 19th century by Schwarz. Due to the complexity of the geometry, it is not possible to manufacture these parts using conventional methods such as turning. For this reason, additive manufacturing stands out as a revolutionary way that allows the production of complex components in a much easier way. Sandwich structures are made by two faces of a resistant material in its exterior and a different material in the core. These structures have been used for decades due to the relation of weight to stiffness in aerospace structures. This paper proposes a manufacturing of sandwich structures with TPMS graded-cells core architecture, made by Fused Deposition Modelling (FDM) and fiberglass faces. One of the most used materials in FDM is PLA (Polylactic acid), a polymer chosen due its ease to print and purchase. Finite element method analysis will also be performed to predict the bending properties of the modelled sandwich. And, in order to validate the numerical data, and to evaluate the properties of the constructed sandwich panels, destructive three-point bending tests will be carried out following the ASTM C393 standard.