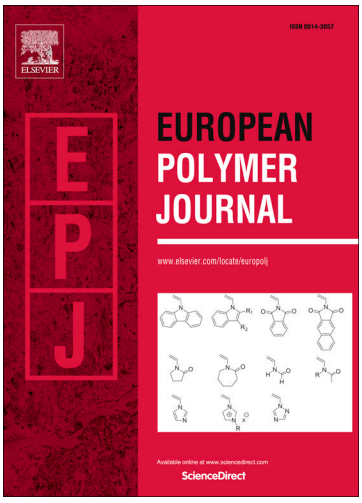

Functionally graded materials from topology optimisation and stereolithography

Tao Liu, Sofiane Guessasma, Jihong Zhu, Weihong Zhang, Sofiane Belhabib

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Functionally graded materials from topology optimisation and stereolithography

Tao Liu[1], Sofiane Guessasma[2*], Jihong Zhu[1*], Weihong Zhang[1*], Sofiane Belhabib[3]

[1]State IJR Center of Aerospace Design and Additive Manufacturing, NorthwesternPolytechnical University, 710072 Xian, Shaanxi, China

[2]INRA, UR1268 Biopolymères Interactions Assemblages, F-44300 Nantes, France

[3]LUNAM University of Nantes Angers Le Mans, CNRS, GEPEA, UMR 6144, IUT de Nantes, 2 avenue du Professeur Jean Rouxel, 44475 CarquefouCedex, France

*Corresponding authors: sofiane.guessasma@inra.fr, jh.zhu@nwpu.edu.cn, zhangwh@nwpu.edu.cn

Abstract

This work reports an integrated strategy to develop functionally graded materials using additive manufacturing technology. Topology optimisation is exploited to design porous structures with controlled amount and distribution of porosity. Designs are printed using stereolithography and their compression behaviour is determined. Designs are scaled down to form unit cells for functionally graded materials with contrasted mechanical properties. The designed unit cells demonstrate a wide variety of performance, which is achieved when combining topology optimisation and additive manufacturing. The compression performance of designed functionally graded materials exhibits distinctive behaviour depending on the nature and arrangement of unit cells. This study concludes on the high potential of topology optimisation and stereolithography to promote 3D printed designs with property-controlled structures.

Keywords

Topology optimisation; stereolithography; functionally graded material; compression behaviour; cellular structures.