简报

多相多孔材料/结构的集成优化设计

孙士平[1]，秦国华[1]，张卫红[2]

1. 南昌航空大学 航空与机械工程学院;
2. 西北工业大学 中法并行工程联合实验室

Integrated Optimal Design of Multiphase Porous Materials and Structures

Sun Shiping[1],Qin Guohua[1],Zhang Weihong[2]

1. Aeronautic and Mechanical Engineering College, Nanchang Hangkong University;
2. Sino French Laboratory of Concurrent Engineering, Northwestern Polytechnical University

摘要	参考文献	相关文章

Download: PDF (2266KB)　HTML 0KB　Export: BibTeX or EndNote (RIS)　Supporting Info

摘要

采用均匀化方法，以宏观结构柔顺度为优化目标，开展了多相多孔材料/结构的集成优化设计。借鉴仿生思想，提出两尺度材料/结构构成模型，归纳出微结构精细设计的选择判据。结合伪密度法和周长控制消除了多相材料分布的棋盘格。采用分层优化方法并结合算例研究了实体材料模量相对比值、材料组分变化对优化结果的影响。计算结果说明所提出的结构构成模型能有效地应用于多相多孔材料/结构的优化设计，为新型多功能材料/结构的设计拓宽了思路。

关键词： 拓扑 优化 多相材料 多孔材料 微结构 均匀化方法

Abstract：

This article presents an extension of the integrated design methodology for topology optimization to multiphase porous materials and structures through maximizing the global stiffness of the overall structure based on the homogenization method. Drawing on concepts in bionics, a two scale integrated design model of material and structure is proposed, and the criteria for the selection of the fine design of multiphase microstructures are obtained. Combining perimeter constraints and the solid isotropic material with penalization (SIMP) law, the optimal distributions of multiphase materials are obtained by elimination of checkerboards. Influences of the elastic module ratio and the volume fraction of solid phases on optimal design are investigated. Numerical results show that the model is well adapted to the design of multiphase porous materials and structures such as honeycomb panels and sandwich panels.

Keywords： topology optimization multiphase materials porous materials microstructure homogenization method

Service

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- Email Alert
- RSS

作者相关文章

- 孙士平
- 秦国华
- 张卫红

引用本文:

孙士平;秦国华;张卫红. 多相多孔材料/结构的集成优化设计[J]. 航空学报, 2009, 30(1): 186-192. DOI:

Sun Shiping;Qin Guohua;Zhang Weihong. Integrated Optimal Design of Multiphase Porous Materials and Structures[J]. Acta Aeronautica et Astronautica Sinica, 2009, 30(1): 186-192. DOI: