

# Static and dynamic design based on hierarchy optimization associating materials and structure

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**Abstract:** A static and dynamic collaborative optimization method associating materials and structure with uniform periodical microstructures is presented. The sensitivity formulae of hierarchical optimization, i.e., material design, structure design and integrated design for porous metals, are given. On the base of the hierarchical optimization model, numerical experiments of a MBB beam and a cantilever one are carried out. The differences and applicability of hierarchical optimization are discussed in the structure loading field. It is concluded that structure design is mainly oriented to structure efficiency, material design is mainly oriented to multi-functionality, and integrated design is oriented to structure efficiency and multi-functionality.

**Key words:** multi-objectives; hierarchical optimization; material design; structure design; integrated design of materials and structure