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智能材料和结构在变体飞行器上的应用现状与前景展望

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Application Status and Future Prospect of Smart Materials and Structures in Morphing Aircraft

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摘要

变体飞行器可以根据不同的飞行条件改变自身形状以获得最优的气动性能，大大提高飞行器的综合性能，是未来飞行器发展的重要方向之一。新型智能材料和结构具有驱动、变形、承载、传感等特点，为变体飞行器的设计提供了新的技术途径。本文根据不同可变形机翼结构分类，详细阐述了智能材料和结构在自适应结构、智能驱动器和变形蒙皮等方面的研究现状。变体飞行器的实现亟需解决变形/承载一体化蒙皮技术、轻质大输出力驱动器技术和自适应结构技术等关键技术，本文还对智能材料和结构未来在变体飞行器上的应用前景进行了展望。

关键词： 飞行器材料 智能材料和结构 变体飞行器 自适应结构 驱动器 变形蒙皮

Abstract:

Morphing aircraft can alter their shapes to achieve optimal aerodynamic performance under different flight conditions, which will greatly improve the comprehensive performance of the aircraft. Their emergence and development is one of the most important trends of future aircraft. Smart materials and structures have the properties of actuating, morphing, loading, sensing etc., which provide a new technological approach to morphing aircraft design. In this paper, research status is elaborated of smart materials and structures in adaptive structures, smart actuators, and morphing skins. Some key technologies are addressed in detail, such as deformation/loading integrative skins, lightweight high-output actuators, and adaptive structures. The future prospect of the application of smart materials and structures in morphing aircraft is also discussed.

Keywords: aircraft materials smart materials and structures morphing aircraft adaptive structures actuators morphing skin

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