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椭圆底扁薄球壳结构的双稳态力学行为

Bi-stable mechanical behavior of shallow thin spherical shell with elliptical bottom

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中文关键词: [双稳态](#) [可变形结构](#) [进发\(进气道/发动机\)匹配](#) [扁薄球壳](#) [跳变类型](#)英文关键词: [bi-stable](#) [morphing structure](#) [inlet-engine matching](#) [shallow thin spherical shell](#) [snap-through type](#)

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中文摘要:

针对可变形鼓包型面设计方案需求,以铰支边界的椭圆底扁薄球壳模型为对象,通过数值仿真研究了结构双稳态构型的转换机理以及需要满足的参数条件;对稳态构型转换中的跳变类型以及影响因素进行了分析;给出了不同驱动方式下,加载位置和形状参数对稳态构型转换需要的临界驱动力以及结构内应变的影响。结果表明:结构在铰支约束下存在双稳态需满足一定的拱高厚度比;稳态构型在转换过程中存在局部跳变和整体跳变组合方式,可以通过选择加载位置和结构参数进行控制;结构发生跳变时的临界载荷和结构内应变与加载方式和结构参数有关。

英文摘要:

To meet the design requirements of a morphing bump surface, a research was conducted on the bi-stable mechanical behavior of a hinged shallow thin spherical shell with elliptical bottom surface. The conversion mechanism and required condition of the shell's two stable configurations were analyzed by simulation method. Also the snap-through type, which occurred in the transition process of stable configurations, and its influential factors, were analyzed. Finally the effects of the loading position and shape parameters on the critical driving force and structural strain were given under different driving modes. The results show that the bi-stability condition of the hinged structure requires a certain ratio of shell height to shell thickness; there exist combinations of local and overall snap-through phenomena during the transition process of the structural stable configurations, which could be controlled by the loading position and structural parameters; in case of structure snap, the critical load and structural strain are related to the load methods and structural parameters.