

折展机构的研究

摘 要

NiTi 形状记忆合金作为一种新型的材料, 凭借其优良的材料性能在电子、机械、医疗、航空航天领域都具有广泛的应用前景。其中在航天领域, 大型的载轨天线都需要使用空间折展机构来进行展开或收缩。本文以 NiTi 形状记忆合金作为研究对象, 利用激光焊接的技术将 NiTi 形状记忆合金焊接到两块太阳能帆板的接头处做连接的折展机构。本次试验采用激光焊接, 但在激光焊接过程中热影响区和焊接区在高能激光束的作用下会有含镍金属间化合物的析出。含镍量的减少会使焊接接头的材料性能有所降低, 希望采用焊接工艺控制、焊缝合金化或者焊后热处理等方法来提高焊接接头的性能。因为对 NiTi 形状记忆合金折展机构其进行了激光焊接处理。所以焊接处理后的折展机构分为了 I、II、III 三个区域, 其中 I 区为母材区它的相变温度最低, II 区为热影响区相变温度次之, III 区的相变温度最高为焊接区。加工完毕后对折展机构进行 ANSYS 动力学仿真, 其形变反应过程与各区域相变温度与设想基本一致。

关键词: NiTi 形状记忆合金; 折展机构; ANSYS 仿真; 相变温度; 激光焊接

Abstract

NiTi shape memory alloy, as a new type of material, has a wide range of applications in the fields of electronics, machinery, medical and aerospace because of its excellent material properties. Among them, in the space field, large-scale orbit antennas need to use space folding mechanism to expand or shrink. In this paper, NiTi shape memory alloy is used as the research object, the NiTi shape memory alloy is welded to the joint of two solar panels by laser welding to make a folding mechanism. Laser welding was used in this test, but in the thermal influence zone and welding area in the laser welding process, there will be nickel-containing intermetallic compounds. The reduction of nickel content will reduce the material performance of welding joints, and it is hoped that welding process control, welding goldization or post-weld heat treatment will be used to improve the performance of welding joints. Laser welding is performed on the NiTi shape memory alloy folding mechanism. Therefore, the folding mechanism after welding treatment is divided into three areas: I, II, III, of which I area is the lowest phase change temperature in the parent area, II area is the thermal influence area phase change temperature, and the phase change temperature of the III area is the welding area. After processing, ANSYS dynamics simulation is carried out on the folding mechanism, and the deformation reaction process is basically the same as the phase change temperature and assumption selected in each region.

Key Words: NiTi Shape Memory Alloy ; Discounting agency ; ANSYS simulation ;
Want to change the temperature ; Laser welding

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