

The research of driving moment analysis and influencing factors of metal-based lenticular tube composite

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Abstract: With the complexity of the aerospace mission, the size of the spatial structure is getting larger and larger. Instead of the traditional space structure, the folding structure allows the large structure of the aerospace to be gathered to a sufficiently small space at launch to facilitate transportation and launch. After entering orbit, it is launched and just transformed into a large structure to perform the aerospace mission. As the main load-bearing component in the aerospace mission, the detachable mechanism is restricted by the parameters of quality, energy consumption, stiffness and precision. It is an important research topic in the field of space agency research to achieve light quality, low energy consumption, high stiffness and high precision. The structure of double omega-lenticular tube is the most widely used form of folding mechanism in aerospace missions. It replaces the traditional mechanical hinge connecting truss rod and can meet the accuracy and stiffness requirements of aerospace missions. Since its birth, it has set off an innovation in the design concept of a folding structure. The double Omega lenticular tube structure can be folded at large angles by elastic buckling and bending, and self-driven expansion can be achieved by the elastic potential energy stored by folding. In order to ensure the precision and stiffness of the task requirements, the purpose of achieving light weight and low energy consumption has been applied more and more. In this paper, the structure of metal base lenticular tube for a spatial expandable shade was studied, and its driving moment is analyzed in combination with theoretical model. The influence of structural geometric parameters and material mechanical properties on the driving moment is quantified, and the dynamic model of the expansion under the combined effect of elastic reinforcement and 3M tape is constructed using simulation tools., and the change of driving moment under the compound action was studied. After the 3M adhesive tape is combined, it is inversely related to the driving moment, which leads to a longer release time and a smaller driving moment, and The failure mode of expansion motion lag is easy to appear. The conclusion of this study is of great significance to the design and configuration optimization of lenticular tube and the selection of the method of technology connection.

keywords : metal-based lenticular tube composite material driving moment