吴靖,孙威,蔡国飙.内加热式N_2O单组元推力器预热过程仿真与试验[J].航空动力学报,2013,28(3):556~560

内加热式N_2O单组元推力器预热过程仿真与试验

Simulation and experiment for preheating process of N_2O monopropellant thruster with inner-heater

投稿时间： 2012-04-10

DOI：

中文关键词： N_2O 单组元推力器 内加热 预热 有限元分析

英文关键词:N_2O monoprorellant thruster inner-heating preheating finite element analysis

基金项目:

作者	单位
吴靖	北京航空航天大学 宇航学院,北京 100191
孙威	北京航空航天大学 宇航学院,北京 100191
蔡国飙	北京航空航天大学 宇航学院,北京 100191

中文摘要:

为了提高N_2O单组元推力器预热效果,对推力器结构做出改进,引入内加热的预热模式.在模拟真空环境下开展了内加热式推力器预热试验,以10W功率加热5800s,使催化剂温度达到260℃(533K),证明了内加热模式的可行性及优越性.开展了内加热式N_2O单组元推力器系统的三维建模,并利用有限元软件对推力器预热过程进行了分析,得到了推力器结构温度场随时间的变化情况.数值分析结果与试验数据吻合良好,验证了所用仿真模型的准确性.进一步对简化结构后的内加热式推力器在模拟太空环境下分别施加10,5,3W加热功率时的预热过程开展了数值仿真研究,结果表明:10W和5W加热功率能使催化剂在3600s内达到工作温度250℃,可为N_2O单组元推力器的实际应用提供参考.

英文摘要:

In order to promote the preheating effect of N_2O monopropellant thruster, the structure of the thruster was improved and inner-heating mode was set up. The preheating experiment of the thruster with inner-heater was conducted in a vacuum chamber, and the catalyst was heated to 260℃(533K) with 10W after 5800s, confirming the feasibility and advantage of the inner-heating mode. 3-D model of the thruster was built and finite element software was utilized to analyze the preheating process. Time-dependent temperature filed of the structure was obtained. Numerical result agrees well with the experimental data, which demonstrates the accuracy of the simulation model. Then a simplified system model of the thruster with inner-heater was designed and 10,5,3W power were utilized to simulate the preheating process in space environment. The result shows that the catalyst will be heated to 250℃ with 10W and 5W power in 3600s, which can provide some references for the practical application of N_2O monopropellant thruster.

查看全文 查看/发表评论 下载PDF阅读器

关闭

友情链接： 中国航空学会 北京航空航天大学 EI检索 中国知网 万方 中国宇航学会 北京勤云科技