

Poster Session (P)

Poster Lunch (1)

Author: Mr. Xi Zhu

Beijing Institute of Spacecraft Environment Engineering, China, zx_cast@sina.com

Mr. Chang Liu

Beijing Institute of Spacecraft Environment Engineering, China, liuchang5115@sina.com

Mr. Bin Shen

Beijing Institute of Spacecraft Environment Engineering, China, shengbin511@126.com

Mr. Peng Guo

Beijing Institute of Spacecraft Environment Engineering, China, guopeng5115@sohu.com

RESEARCH ON HIGH TEMPERATURE SIMULATION AND CONTROL FOR MULTILAYER INSULATION OF LUNAR LANDER

Abstract

The lunar lander is subjected to a considerable landing impact load when landing, generally using a large thruster to reduce its landing speed. Due to the combined effects of thruster radiation and plume, the temperature of the multilayer insulation assembly near the thruster is above 1000 degree Celsius in 140 seconds. In this paper, the infrared heating method under vacuum conditions is used to simulate high temperature and the nonlinear PID controller is used to control the temperature of the multilayer insulation and simulate the temperature boundary condition of the thruster. The dynamic characteristics of the infrared lamp heater and fast temperature control algorithm are studied. A high temperature simulation and control system is set up in the vacuum vessel, and the physical experiment is carried out. The experimental results show that the gain of infrared lamp increases rapidly with the increase of current and temperature, and the time constant decreases rapidly with the increase of current and temperature. For the target temperature of 1050 degree Celsius, the control algorithm makes the temperature of specimen reach a steady state in 136 seconds and the overshoot is 0.1 degree Celsius.