

IAF SPACE PROPULSION SYMPOSIUM (C4)  
Interactive Presentations - IAF SPACE PROPULSION SYMPOSIUM (IP)

Author: Ms. Qun Liang  
Northwestern Polytechnical University, China, 1162253873@qq.com

Mr. Feng Xiping  
Northwestern Polytechnical University, China, fengxiping@nwpu.edu.cn

Mr. Li Jian  
The 41st Institute of the Fourth Academy, China Aerospace Science and Technology Corporation (CASC),  
China, kunni12@sina.com

Mr. Hou Xiao  
Northwestern Polytechnical University, China, houxiao@nwpu.edu.cn

Ms. Du Ying  
China Aerospace Science and Technology Corporation (CASC), China, 383071238@qq.com

INFLUENCE RULE AND GLOBAL SENSITIVITY ANALYSIS OF PARAMETERS DURING CURE  
PROCESS OF SRM COMPOSITE CASE**Abstract**

The motor case for modern SRM is a complex composite structure with fiber reinforced resin matrix composite, EPDM insulation and metal connections, the case forming process is a multi physical-chemical process which involving heat transfer, chemical reaction and structure deformation. During the cure process, temperature determines whether the case cure completely and the uniformity of temperature field is an important factor in causing residual thermal stress and shrinkage stress, so temperature field is the key to the mutual coupling effect of each physical and chemical process, and the basis to analyze the cure process of the case. During the cure process of case, fluctuation of cure temperature, cure time or heat transfer of hot air in the furnace may occur, which make the actual forming process of case deviate from the ideal cure process. In order to investigate the sensitive degree of thermal cycle, convective heat transfer coefficient and thermal properties to cure uniformity during cure process of composite case, the influence rule of the three factors on uniformity of temperature and cure degree fields were analyzed by numerical simulation. A thermal-chemical model was built for a simplified composite SRM case firstly, and the model was verified. Then, the influence degree of the three factors on cure uniformity of composite case was analyzed and quantized by the Morris global sensitivity analysis method. The results show that the thermal cycle and the convection heat transfer coefficient have significant effect on the temperature field. lower heating rate and extend holding time can improve the uniformity of temperature field under the condition that amplifications of each sub- cycle are constant. While the heat transfer coefficient increase, the temperature of the case can be improved effectively under the same cure cycle.