

MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Advanced Materials and Structures for High Temperature Applications (4)

Author: Prof. Wei Zhang  
National University of Defense Technology, China

Dr. Dong Yang  
National University of Defense Technology, China

THERMO-CHEMICAL ABLATION CHARACTERISTICS OF SILICONE RUBBER BASED  
INSULATOR

**Abstract**

Internal insulation material is used for the heat insulation, anti-oxidation and anti-ablation layer in the ram-combustor of rocket ducted ramjet. Silicone rubber based internal insulator, which burned very slowly, is mainly made of methyl vinyl silicone rubber, vinyl phenyl silicone rubber, silica, and carbon fiber. Under the oxidative and high-temperature environment in ram-combustor, the insulator will undergo such processes as thermal decomposition, ceramization and oxidation. The ablation structure of the silicone rubber based insulator, e.g. the combination of thermal decomposition layer, ceramic layer and oxidation layer, was determined by the sectional photo of the insulator ablated by the oxygen-acetylene flame stream. The thermal decomposition characteristics of the insulator were investigated by means of thermal analysis and pipe furnace. The ceramization characteristics of the condensed products after thermal decomposition were studied in pipe furnace. The oxidation characteristics of the condensed products after ceramization were investigated by means of the thermal analysis and pipe furnace. The compositions of these products of the insulator were characterized by means of XPS, SEM/EDS and XRD. The main chemical reactions and dynamic formulae in the thermal decomposition, ceramization and oxidation processes of the insulator were obtained.