

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

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FABRICATION AND VALIDATION TEST OF A NOVEL THERMAL PROTECTION STRUCTURE
BASED ON HEAT PIPE TECHNOLOGY FOR COMBUSTION CHAMBER OF SCRAMJET

Abstract

The thermal protection design for combustion chamber is a huge challenge and key technology in scramjet development. A novel chamber panel structure based on high temperature heat pipe and active cooling techniques is proposed to improve the scramjet thermal protection performance. A flat pattern heat pipe specimen with a cooling fuel channel is designed and manufactured as the test model. Demonstration tests with fuel cooling under heating from a quartz lamp are carried out to verify the feasibility of this concept. The test results show that the heat pipe has fine isothermal performance which is favorable to bring the temperature gradient down, and the heat transfer between the heat pipe and the fuel coolant effectively reduces the temperature. The design of the coolant channel in the panel is optimized based on the test results and computation analysis. It is proposed that this new approach has potential application in thermal protection system of scramjet combustion chamber. It is proposed that this new approach has potential application in thermal protection system of scramjet combustion chamber.