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REVIEW ON LIGHTWEIGHT GRADED NON-ABLATION STRUCTURE FOR HYPERSONIC VEHICLES

Abstract

Thermal protection structures which are correlated to the safety of hypersonic vehicles, are one of the most critical techniques in design and manufacture of hypersonic vehicles. Light-weight, non-ablation and long-time have been required for TPS due to long-time hypersonic flying in the atmosphere. The problem of present thermal protection system are prone to ablation or fragmentation. In this paper, A design of graded, integrated structure has been brought forward in order to avoid recession or fragmentation. According to our design idea, the preparation method and technology of lightweight graded article has been investigated. Fabrication and wind tunnel test have been performed. Graded lightweight article with dense low to 0.45g/cm3 has been prepared successfully. During its high-speed entries, the graded surface treatment on the cap provides dimensional stability, while the fibrous base insulation material provides a low thermal conductivity insulation to protect the vehicle structure. The integrated article, has graded surface treatments applied by impregnation to the whole articles. High temperature test to evaluate the thermal performance of graded integrated structure has been tested in the wind tunnel, which surface temperature reached to 1973K high temperature for 550 seconds exposure. The results have been shown that the surface of articles still maintained original configure.