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INTEGRATED DESIGN PROPOSAL FOR A LIGHTWEIGHT AND EFFICIENT HEAT
PROTECTION AND INSULATION TECHNOLOGY

Abstract

For the traditional heat protection scheme for ablation resistance materials, the two concepts of being lightweight and ablation resistant conflict each other. This paper proposes an integrated heat insulation and protection technology, with the surface adopting ablation resistant materials and the interior using heat insulation materials of high efficiency, which greatly improves heat protection and insulation efficiency as well as achieving better ablation resistance. Considering the surface heat protection materials seal the heat insulation materials on the inside, however, the pyrolysis gas produced by heat protection materials plus the gas expansion inside the insulation materials tend to cause the separation of the two materials or fracture of the surface materials. Consequently, setting holes on the surface of outer heat protection layer, without reducing thermal efficiency, is able to effectively solve the compatibility between the heat protection and insulation layers. The use of quartz lamp radiation heating equipment in the heating test verifies the above technology is efficient in heat protection and capable of heat compatibility. Integrated heat insulation and protection technology provides an approach to accomplish lightweight and efficient heat insulation and protection for thermal protection system.