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MORPHOLOGY AND ANTI-ABLATION PROPERTIES OF COMPOSITES NOZZLES UNDER THE 100MM H2O2- PE HYBRID ROCKET MOTOR TEST

Abstract

In this research, several types of carbon fiber reinforced composites like four kinds of 3D carbon/carbon composite and one Cf/SiC-ZrC composite utilized in high temperature environment were employed to make the hybrid rocket nozzle. By comparison with the high-density graphite, the anti-ablation properties under the 100mm H2O2-PE hybrid rocket motor firing environment were characterized. Four kinds of C/C material including felt based, needled, 3D braided and fine-woven punctured felt carbon fiber architectures reinforced the chemical vapor infiltration (CVI) and pitch carbon. The felt based low density C/C billet was modified with Si and Zr organic precursors to make the advanced ceramic composite. The firing test lasted 40s for all the candidate materials and the result indicated that the ceramic based composite, whose average linear ablation rate was only 0.010mm/s, was most stable in the firing environment. The SEM images gave detailed morphologies of those throat materials and proved that the material structure together with the ceramic material itself helped the nozzle to withstand the hybrid fuel environment.