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PERFORMANCE ANALYSIS OF A SWIRL INJECTOR WITH POLYURETHANE BINDER AND
PARAFFIN AS ADDITIVE

Abstract

In this study, the fuel was synthesized with polyurethane (binder) based on the technology of modifying a prepolymer with castor oil with the addition of 30% paraffin and 10% aluminum powder. An axial injector and a swirl were used. Regression rates doubled with the addition of paraffin and mechanical properties increased dramatically. Impulse measurements indicate that the addition of paraffin increased the buoyancy by about 57% and the regression rates by about 70%. The mixture that produced the best ballistic parameters was polyurethane plasticized with castor oil and 30% w/w paraffin with gaseous oxygen injected with a swirl. The turbulence injector improved efficiency and regression rates. Jointly, the investigation of the applicability of a high temperature coating was studied in the case of a hybrid rocket engine where different engine components received the coating application. Once coated, the components were assembled and subjected to firing tests. The results were very promising, as the coating proved to be able to reduce nozzle throat erosion by up to 50%, improving the operation time of the hybrid rocket engine at temperatures approaching 2,000 degrees Celsius.