Paper ID: 28989
student

45th STUDENT CONFERENCE (E2)
Student Conference - Part 2 (2)

Author: Mr. Sheng Zhao
Beihang University (BUAA), China

Mr. Xingliang Sun
Beihang University (BUAA), China

EXPERIMENTAL INVESTIGATION OF MULTIPLE CATALYST IGNITION OF HYDROGEN PEROXIDE HYBRID ROCKET MOTOR

Abstract

Hydrogen peroxide is one of the most commonly used oxidizers in hybrid rocket motors and can be catalytically decomposed to ignite solid fuels and achieve multiple starts. As a promising way of ignition, catalyst ignition simplies the structure and schedule of ignition process, which further highlights the simplicity and safety of hybrid rocket motors. However, compared with other devices of ignition, the delay time of catalyst ignition is often long with large uncertainties in hybrid motors. In this paper, investigation of catalyst-ignited subscale 90% hydrogen peroxide hybrid motors was done. Experiments with different oxidizer mass flux were conducted in order to estimate and decrease the delay time of ignition. The ignition process was subdivided into five parts: the response of valve, the filling of feed-line before catalyst bed, the start-up of catalyst bed, the build-up of pressure in combustion chamber and the inert heating of solid fuel. Effects of mass flux of hydrogen peroxide, temperature of catalyst bed, scale of fuel grain were taken into account. The results indicate that ignition delay time of multiple starts decreases with the increase of mass flux of hydrogen peroxide and temperature of catalyst bed, as well as the decrease of scale of grain. The delay of ignition signicantly decreases in short-time restarts. Subsequently, multiple ignition test of metallized HTPB (28%Al,10%Mg) with 90% hydrogen peroxide was carried out on a Φ300mm hybrid rocket motor. A catalyst ignition hybrid rocket motor was used to ignite the main motor and multiple start of the main motor was achieved.