World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:11, No:11, 2017

Experimental Investigation of Hybrid Rocket Motor: Ignition, Throttling and Re-Ignition Phenomena

Authors : A. El-S. Makled, M. K. Al-Tamimi

Abstract : Ignition phenomena are of great interest area over the past many years, and it has a direct impact on many propulsion and combustion applications. The direct goal of the paper is to realize and evaluate a functioning ignition method, shut-off, throttling and re-start operations for the hybrid rocket motor. A small-scale hybrid rocket motor (SSHRM) is designed, manufactured, demonstrated at various operating conditions and finally equipped for laboratory firing tests with high level of safety. Various solid fuel grains as Polymethyle-methacrylate (PMMA) and Polyethylene (PE) are selected, and it is decided to use the commercial gaseous oxygen (GO2) for its availability and low cost. Examine different types of ignition methods, pyrotechnic charge, fuse wire, heat wire and finally hot oxidizer method by using the heat exchanger, which are proposed as very safe ignition methods. Finally; recognize phenomena of throttling and re-start operations. Ignition by hot GO2 impingement is proved to be a very attractive ignition method for laboratory SSHRM, for its high safety, reliability and acceptable delay time. Finally; the throttling and re-start operations are demonstrated several times and can be carried out more easily with hot air ignition method.

Keywords : hybrid rocket motor, ignition system, re-start phenomena, throttling
Conference Title : ICAST 2017 : International Conference on Aerospace Engineering and Spacecraft Technologies
Conference Location : Dubai, United Arab Emirates
Conference Dates : November 24-25, 2017