

Investigation of a laboratory scale HTP/HTPB hybrid rocket motor

At the Institute of Aviation (IoA) a research programme on rocket propulsion using 98% hydrogen peroxide has been initiated. The own method of preparation of ultra pure, 98%+ class High Test Peroxide, has been invented and developed. Adequate amount of HTP, which is essential for fire tests, is prepared in the Propellant Laboratory at IoA.

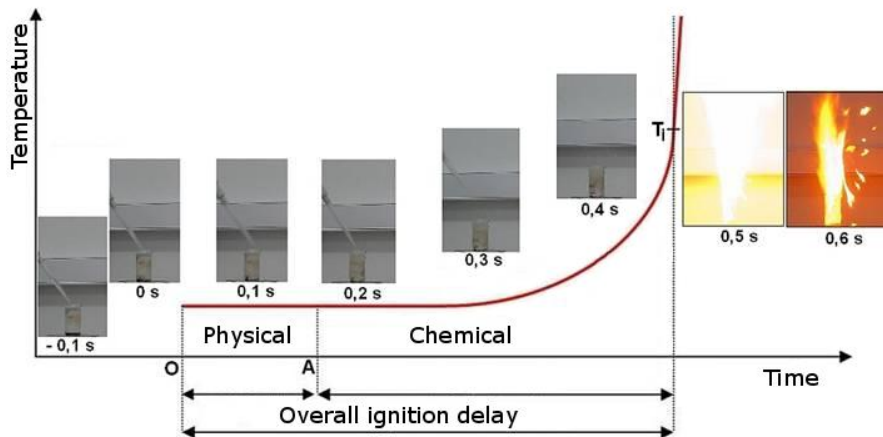


Figure 1. Catalytic decomposition of HTP and fuel ignition.

In 2012 a small, 100N of thrust, hybrid rocket motor (HRM) was designed, built and tested. The motor was configured as self-ignitable and restartable. The Ultra pure 98% HTP was used as oxidiser. Pressurization system for HTP supply was built. The HRM used a catalyst chamber for decomposition of HTP. Fuel grain was made of pure hydroxyl-terminated polybutadiene (HTPB synthetic rubber).

The paper contains a concise description of work on HRM design process. Results of fire tests, containing trust measurement, pressures, temperatures, ignition delay are presented.

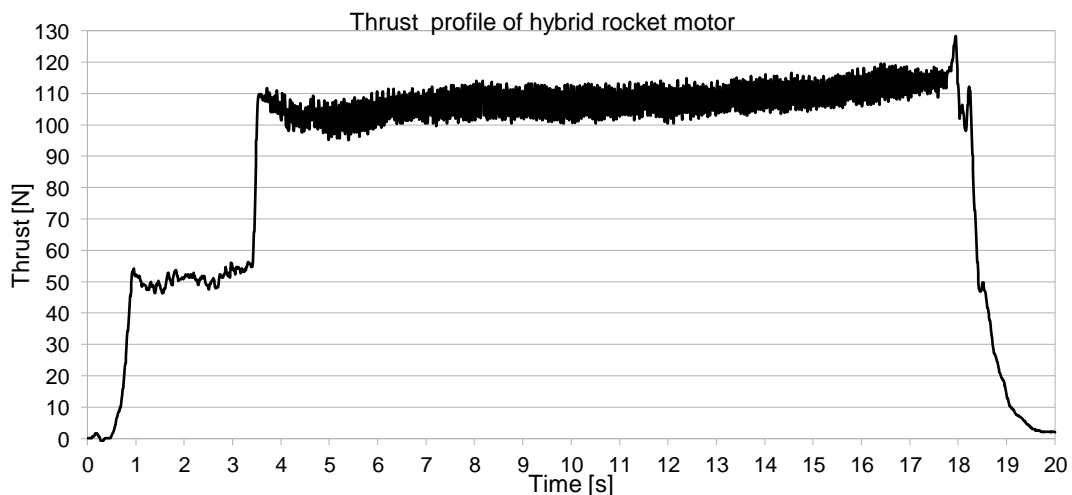


Figure 2. Thrust profile of hybrid rocket motor.

Special attention is drawn to the problem of ignition delay, which is connected to catalyst chamber cold start and caused mainly by the time required by the HTPB pyrolysis products to reach their auto-ignition temperature. Several solutions, which were investigated in order to minimize

ignition delay, are described. Aspects of future work at the IoA on hybrid propulsion as well as mono- and bi-propellant, based on HTP, is discussed.

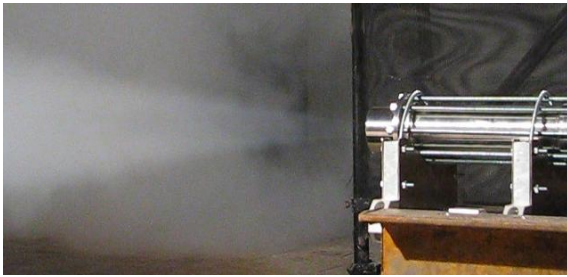


Figure 3. Catalyst chamber test.



Figure 4. Shock pattern during the test of HRM.

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