SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Technology (3) (10)

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RESEARCH ON THERMAL DECOMPOSITION OF HYDROGEN PEROXIDE FOR LOW THRUST PROPULSION SYSTEM APPLICATION

Abstract

One of the most commonly used Attitude Control System (ACS) is based on simple monopropellant thrusters which uses a single substance that decomposes to a hot gas. The gas is delivered into the nozzle producing the thrust. Nowadays hydrazine and its derivatives are first-choice propellants for such an application due to their good performance, well known technology and long history in space flights. Unfortunately hydrazine is also extremely toxic, inflammable and carcinogenic what makes the testing and ground handling dangerous and expensive. Increasing environmental care and cutting cost requirements result in constant searching for alternative solutions. One of the most promising alternative for hydrazine is highly concentrated hydrogen peroxide (H2O2). It decomposes to hot steam and oxygen what makes it completely safe for environment and allows calling it a green propellant. Stability, easiness of production and reasonable specific impulse (1600-1700 m/s) as well as safety of ground handling makes it very interesting substance for space propulsion application. Unfortunately, many research indicates problems with catalyst pack for H2O2 decomposition. Lower grade H2O2 with stabilizers can poison the catalyst pack lowering its performances. Higher grade (ab. 98%) generates very high temperature (about 1200 K) which is able to melt the metallic catalyst (e.g silver) or increase the temperature gradients in ceramic one causing it to crack. But there is a way to overcome those problems. Hydrogen peroxide decomposition can be also started and maintained by the temperature source – without any catalytic substance. In this paper authors would like to present the research on possibility of using thermal decomposition of highly concentrated hydrogen peroxide (98%+) for low thrust propulsion system application. The research stand for thruster parameters measurements was built and will be presented followed by the experimental results, discussion of problems encountered and authors' conclusions and future plans.