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Solid and Hybrid Propulsion (2) (4)

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THERMOPLASTIC SOLID PROPELLANT ANALYSIS

Abstract

Solid propellants consist of fuel and oxidant and are widely used in the aerospace industry. This article will show simplified processing (pressing or extruding) of modern propellants and thermoplastic binder. The propellants are composed of Potassium Nitrate (KNO3) and Lithium Perchlorate (LiClO4) as oxidant and Sorbitol (C6H14O6), Aluminum (Al), Thermoplastic Polyurethane (TPU) and Polyvinyl Chloride (PVC) as fuel. The use of lithium is to improve the performance of propellant with nitrate and allow the development of solid propellants that generate gas with metallic particles to burn in a ramjet or scramjet chamber. Hot pressing tests were performed to generate test specimens, which will be subjected to physical characterization: density, hardness and burning tests in a constant volume bomb, to measure the burning speed using ultrasound waves. The ultrasound sensor detects the size of the specimen during the experiment and based on the time of burning we have the burning speed. That way is possible to present results for various formulations of the cited constituents. The data obtained from the burning for each composition with thermodynamic data, density, firing temperature were presented and a comparison was made of effectiveness of each one for use in ramjet and scramjet.