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ENERGETIC AND SUSTAINABLE ROCKET PROPELLANT FOR LOWER STAGE

Abstract

Energetic propellants have the ability to lower total life cycle costs, access to space expenses, and environmental impact. Modern space advancements have resulted in the development of a variety of simpler and less expensive rocket systems. Environmental concerns, as well as later legislative requirements, require that green and sustainable propellants be substituted for existing (hydrazine-based) toxic propellants with minimum performance loss. Because of its versatility and benign nature, ethanol is a feasible candidate for the future of energetic propellants. Because of its non-hazardous properties, it may be used to build simple, cost-effective, and environmentally friendly propulsion capable of replacing hydrazine or other high-performance toxic propellants. Systematic modelling with NASA CEA software was part of the work. A comparison of liquid ethanol with various oxidizers such as nitrous oxide, liquid oxygen, per oxides, and so on was performed, and then for various area ratios of different rocket engines. Some energetic elements were introduced to boost performance. Thrust and Specific Impulse was considered as performance parameters. It requires commendable efforts to create a propellant combination that can increase driving characteristics, energy materials, and the emission of hazardous exhaust gases. An evaluation of the exact proportional employment of rocket fuel oxidizers as drivers is also proposed. The effectiveness and related thermochemistry of liquid fuels of various energy fuels, oxidants, and selected catalysts were examined. By modifying the area ratio and chamber pressure to achieve the greatest performance under Earth conditions, the performance was evaluated in terms of changes in specific impulse, characteristic velocity, and thermodynamic potential. This is because the underlying energy in the material affects the performance of the fluid driver. There are various examples of energy substances being used in proportion. The main objective was to improve performance and safety by minimizing the overall cost of generating, storing, and venting hazardous gases. The effort primarily focuses on improving lower stage propellant performance, as well as reducing reliance on cryogenic propellants and focusing on greener emissions.