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DEVELOPMENT OF HIGH-PERFORMANCE SOLID ROCKET PROPELLANTS USING AP-HTPB COMPOSITE MATRIX AND DIFFERENT PLASTICIZERS

Abstract

The development of solid rocket propellants with high specific impulse and improved mechanical properties is crucial for the aerospace industry. This research paper aims to develop a new composition of solid rocket propellant using an AP-HTPB composite matrix mixed with different types of plasticizers to find the most compatible one with AP-HTPB fuel. The use of plasticizers is critical in solid rocket fuels as they increase flexibility and reduce brittleness, allowing the fuel to withstand the stresses and strains of launch and flight. Plasticizers offer advantages such as improved mechanical properties, increased burn rate, improved safety, and lower costs. This study aims to test different composites with various plasticizers and weight percentages to balance their benefits against potential risks. The study will measure several parameters, including viscosity vs time graph, hardness vs time graph, tensile strength, strain, Young's modulus, and ballistic performance, such as chamber pressure, burn rate, specific impulse, and pressure vs time graph. The data will be compared with standard rocket propellants such as AP-HTPB with Dioctyl Adipate (DOA) as a plasticizer using open-source and commercial software, including NASACEA, RocketCEA, ANSYS Chemkin, and RPA. The results of this study will contribute to the development of solid rocket propellants with increased specific impulse, processability, and ease of manufacturing, thereby lowering costs. The findings of this study will aid in selecting the most compatible plasticizer with AP-HTPB fuel, contributing to the development of high-performance solid rocket propellants. This study has the potential to improve the mechanical and ballistic properties of solid rocket fuels, making them more efficient, safer, and cost-effective for use in the aerospace industry.