Regression Rate Enhancement of Hybrid Rocket Motors using Mixed Hybrid Concept PALANI KUMAR CHIDAMBARAM, AMIT KUMAR, IIT Madras, Chennai-600036, India — Low regression rates have been a major problem for hybrid rocket motors. In the present study, the effect on regression rate by adding ammonium perchlorate (AP) in solid fuel is studied numerically. AP mixed with HTPB is used as solid fuel and gaseous oxygen (GOX) is used as oxidizer. Solid fuel compositions are chosen such that the rocket motor retains start-stop capability. A reduced three step mechanism proposed in the literature is utilized to simulate the combustion. In the combustion chamber, two distinct flame fronts are captured. AP decomposition reaction forms a premixed flame front near the fuel surface. The AP decomposed products also react with HTPB. Heat released in these reactions improves the heat transferred to solid fuel and the regression rate significantly. Un-burnt fuel in the products further reacts with GOX forming a diffusion flame front farther from fuel surface. The presence of premixed flame front thus overcomes the low-regressing nature of hybrid combustion. It is found that 50% AP in solid fuel increases the regression rate by as much as 3 times.

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