

SPACE PROPULSION SYMPOSIUM (C4)
Poster Session (P)

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EXPERIMENTAL INVESTIGATION AND NUMERICAL SIMULATION ON COMBUSTION
CHARACTERISTIC OF SOLID FUEL RAMJET**Abstract**

According to pyrolysis principle of propellant, based on secondary development technology by using the User Defined Functions, which was included in software FLUENT, the pyrolysis and combustion model of (Polymethylmethacrylate) PMMA in SFRJ(Solid Fuel Ramjet) combustion chamber was established. It was described with two-step chemical reaction, RSM turbulent model, Eddy Dissipation turbulent combustion model and second order upwind scheme. The combustion behavior of PMMA in SFRJ was performed using a direct tube test facility. The experiments results prove that the ignition method was reliable, and the SFRJ works stably. The results show that: as the axial distance increases, the local regression rate increases at first then decreases gradually. As the fuel port diameter increases, the reattachment point moves downstream, and the mean regression rate of PMMA decrease. The predicted results of the numerical model coincide well with the experimental data, the reliability of numerical model was verified. The error of mean regression rate was less than 7.7%, the error of pressure of aft-mixing combustion chamber was less than 15.3%, the error of temperature of aft-mixing combustion chamber was less than 22%. While the fuel port diameter was smaller ($D_p=30\text{mm}$), the SFRJ combustion chamber will produce phenomenon similar to erosion effect in solid rocket motor.