

26th National Symposium on Cryogenics and Superconductivity

Contribution ID : 83

Preliminary design and analysis of tripropellant rocket engine

Thursday 23 Feb 2017 at 12:30 (00h15')

Content :

Tripropellant rocket can be designed in two ways- either by adding a metallic fuel like Al or Be to the bipropellant system or can be a semi-cryogenic. Here, the mode used is semi-cryogenic, where we use liquid oxygen as oxidizer, liquid hydrogen and kerosene based RP-1 as fuels. The main advantage of semi-cryogenic system is that it combines high thrust of a hydrocarbon fuel and high specific impulse of cryogenic propellants. The preliminary analysis is done in RPA (Rocket Performance Analysis) where we get the thermodynamic and transport properties along with performance parameters variation with altitude. The results are validated using CEA (Chemical Equilibrium and Applications). Using the results obtained from the analysis, the thrust chamber and 80% bell nozzle is designed using the parabolic approximation method. Thrust chamber cooling analysis is done using the regenerative cooling method where LH₂ is used as the coolant which takes up the heat released by the combustion gases and thus raises enthalpy of the fuel before entering the combustion chamber. CFD analysis is done using the designed geometry by considering rectangular cooling channels.

Primary authors : Mr. K, AZHAR (NIT CALICUT)

Co-authors : Dr. KUZHIVELI, BIJU T (NIT CALICUT)

Presenter : Mr. K, AZHAR (NIT CALICUT)

Session classification : Technical Session 5

Track classification : Cryogenics Storage and transfer lines / Space Research / Cryogenic Test & Test Facilities

Type : Contributory Talk