

SPACE PROPULSION SYMPOSIUM (C4)  
Hypersonic and Combined Cycle Propulsion (5)

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THE STUDY OF FUEL INJECTOR ARRAYS FOR SCRAMJET COMBUSTION

**Abstract**

As we knew that the rapid fuel and air mixing was one of the most important problem in scramjet. The objective of this investigation is to find the method to increase the fuel mixture in supersonic combustion. Firstly, we simulated the fuel injecting interaction and the mixing course in supersonic flow by the method of LES (Large-eddy simulation). In this part, we gave the detail LES models of supersonic turbulent. And we used the finite difference method with WENO scheme for spatial derivatives with 5th order accuracy. Also, we designed two kinds of injectors arrays for scramjet, and did injecting interaction experiment in supersonic flow. Then, we discussed the injecting influence to the supersonic mixing. In this part, we studied the pressure variety of injector arrays, and analyzed the velocity field of injector arrays. The results show: strong shocks would disturb the streamwise vortices and arouse instability, which lead streamwise vortices break off. The bigger injecting opposite angle would increase the momentum ratio between main flowing and fuel injecting, which lead the injection bow shock become stronger and move forward. Finally, we put forward the project of aerodynamic ramps fuel injectors in scramjet. After the relative simulation and experiment, we came to the conclusions: the strong shocks of the 4-injectors array led obviously flow loss. At the same time, the 9-injectors array has better mixing capability.