CONJUGATE HEAT TRANSFER ANALYSIS OF SCRAMJET COMBUSTOR

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Abstract

Conjugate Heat Transfer (CHT) simulation with reacting flow in scramjet combustor is performed. Three dimensional RANS equations with k-ω turbulence model, EDM combustion model for fluid domain and energy equation in the solid domain are solved simultaneously using commercial CFD software. The SCHOLAR scramjet combustor experiment is taken as a test case of validation. The computed flow properties match reasonably well with experimental data and other numerical simulations. Near fuel injection locations, computed surface temperatures over predict experimental data due to use of fast chemistry for combustion modeling. In the downstream, at the diverging section of the combustor, computations under predict the surface temperature. Use of natural convection boundary condition is found to have marginal effect in the surface temperature history of the scramjet combustor. Temperature dependent material properties are found to have significant effect in the distribution of temperature across the combustor wall.

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