NUMERICAL SIMULATION OF SUPERSONIC MIXING IN A BURROWS–KURKOV COMBUSTOR BY USING SA-RANS METHOD

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Abstract: Numerical model of mixing of parallel spatial turbulent supersonic flows is developed. The Reynolds-averaged Navier–Stokes (RANS) approach, based on Spalart–Allmaras (SA) turbulent model supplemented with a turbulent diffusion mixing model is used. The averaged Navier–Stokes equations system closed with the turbulence model equation is solved with the LU–SGS–GMRES (lower-upper symmetric Gauss–Seidel generalized minimal residual) method. For the SA turbulence model and turbulent diffusion model, numerical algorithms validation in multicomponent gas mixtures, modeling of hydrogen injection into the $\mathrm{M} = 2.44$ inert gas flow, and their further mixing in the model Burrows–Kurkov combustor is conducted. The problem is solved in two- and three-dimensional cases. The results are compared with available experimental and computational data. The calculations are performed on “MVS-10P” JSCC RAS cluster.

Keywords: supersonic flows; mixing; Spalart–Allmaras turbulence model; Burrows–Kurkov combustor; LU–SGS–GMRES algorithm

DOI: 10.30826/CE19120308

Acknowledgments

This work was supported by the subsidy given to the Scientific Research Institute for System Analysis to implement the state assignment on the topic No. 0065-2019-0005 “Mathematical modeling of dynamic processes in deformable and reactive media using multiprocessor computational systems” (Registration No. AAAA-A19-119011590092-6).

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Received August 27, 2019

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