

FLUID DYNAMICS OF COMPRESSIBLE FLOWS OF SUBSTANCES GOVERNED BY COMPLEX THERMODYNAMIC MODELS

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ABSTRACT

The topic of the symposium is the study of compressible fluid flows for which the fluid thermophysical properties must be calculated with complex models as opposed to the ideal gas law. This is the case, e.g., for fluid flows occurring in the dense gas or supercritical thermodynamic region, condensing or evaporating. Cavitation (evaporation) and nucleation (condensation) are also topics covered by this symposium.

Examples of such studies can be found in the so-called nonclassical gasdynamics field, turbomachinery design, supercritical extraction processes, etc.

Works submitted to this session can be numerical, theoretical or provide experimental validation.

The objective of the symposium is the creative comparison of the various approaches and the continuation of the effort in creating a community around this interesting and novel subject, involving many promising applications which all share a common physical and theoretical background.

REFERENCES

- [1] J. Hoffren, T. Talonpoika, J. Larjola, and T. Siikonen. Numerical Simulation of Real-Gas Flow in a Supersonic Turbine Nozzle Ring. *J. Eng. Gas Turbine Power*, **124**:395–403, 2002.
- [2] Edwards, J.; Pinto, A.; K.-C.Lin and Jackson, T. Simulation of Injection of Supercritical Methane/Ethylene Mixtures into Nitrogen, AIAA Paper 2003-4267, 2003
- [3] P. Colonna and S. Rebay. Numerical simulation of dense gas flows on unstructured grids with an implicit high resolution upwind Euler solver. *Int. J. Num. Meth. Fluids*, Vol. **46**, 735–765, 2004.
- [4] S.J. Schmidt, I.H. Sezal and G.H. Schnerr, Compressible Simulation of High-Speed Hydrodynamics with Phase Change. In proceedings of *ECCOMAS CFD 2006 Conference*, Egmond aan Zee, NL, 2006.
- [5] Rubecchini, F., Marconcini, M., Arnone, A., Maritano, M. and Cecchi, S. The Impact of Gas Modeling in the Numerical Analysis of a Multistage Gas Turbine, ASME Turbo Expo 2006: Power for Land, Sea & Air, Barcelona, Spain, 8-11 May, ASME paper GT2006-90129, 2006.