Molecular Extended Thermodynamics of a Rarefied Polyatomic Gas

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Abstract

Extended Thermodynamics can be considered as a theory of continuum with structure because there are new field variables with respect to the classical approach and they are dictated at mesoscopic level by the kinetic theory. In this talk I present some recent results on so-called Molecular Extended Thermodynamics (MET) in which the macroscopic fields are related to the moments of a distribution function that for polyatomic gas contains an extra variable taking into account the internal degrees of freedom of a molecule. The closure is obtained via the variational procedure through the Maximum Entropy Principle. Particular attention will be paid on the simple model of MET with six independent fields, i.e., the mass density, the velocity, the temperature and the dynamic pressure, without adopting near-equilibrium approximation. The model obtained is the simplest example of non-linear dissipative fluid after the ideal case of Euler.

The system is symmetric hyperbolic with the convex entropy density and the K-condition is satisfied. Therefore, in contrast to the Euler case, there exist global smooth solutions provided that the initial data are sufficiently smooth.

References

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