

The Unsteady Non-Equilibrium Distribution Function and Exact Equilibrium Time for a Dilute Gas Affected by Thermal Radiation Field

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Abstract : The behavior of the unsteady non-equilibrium distribution function for a dilute gas under the effect of non-linear thermal radiation field is presented. For the best of our knowledge this is done for the first time at all. The distinction and comparisons between the unsteady perturbed and the unsteady equilibrium velocity distribution functions are illustrated. The equilibrium time for the dilute gas is determined for the first time. The non-equilibrium thermodynamic properties of the system (gas+the heated plate) are investigated. The results are applied to the Argon gas, for various values of radiation field intensity. 3D-Graphics illustrating the calculated variables are drawn to predict their behavior. The results are discussed.

Keywords : dilute gas, radiation field, exact solutions, travelling wave method, unsteady BGK model, irreversible thermodynamics, unsteady non-equilibrium distribution functions

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