

Effect of abrupt change of the wall temperature in the kinetic theory

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Abstract

We investigate the response of a dilute gas to the abrupt change of the temperature of the bounding wall on the basis of the Boltzmann equation. Consider a semi-infinite expanse of a rarefied gas with density ρ_0 bounded by an infinite plane wall. The gas is initially in equilibrium with the bounding gas at temperature T_0 . We study the asymptotic behavior of the gas when the temperature of the wall is suddenly changed to T_w at time $t = 0$ and then is kept constant. We show that for short times the solution represents a perturbation to the linearized free molecular flow. We also obtain the asymptotic expansion of the solution for large times.