

Abstract

Sherif G Elsharkawy

Heat Transfer in Noble Gases Using Direct Simulation Monte Carlo Technique (DSMC)

Heat flow, temperature and density distributions in rarefied gas between two plates at rest with different Knudsen number values are analyzed using Direct Simulation Monte Carlo technique. The molecules are considered as hard sphere ones while the gas boundaries are diffusive surfaces. The results of the technique are compared to different methods. A sample problem of Helium gas between two plates at rest is used as basis for such comparison. The temperature ratio had been taken as 1.3265. The heat flow comparison shows a good agreement with 4-moment and Ohwada methods for Knudsen numbers higher than 0.2. The Direct Simulation Monte Carlo results fluctuate around the continuum solution for Knudsen numbers lower than 0.2. These statistical fluctuations were less than 15%. The temperature and density profiles show the wall jumps for Knudsen numbers higher than 0.2. These non-continuum effects are noticeable for Knudsen number equal to 1.0. For Knudsen numbers lower than 0.2, these non-continuum effects disappear.