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Molecular Gas Dynamics on Evaporation and Condensation Induced by Nonlinear Gas Oscillation MASASHI INABA, Division of Mechanical and Space Engineering, Hokkaido University, TAKERU YANO, Department of Mechanical Engineering, Osaka University, MASAO WATANABE, SHIGEO FUJIKAWA, Division of Mechanical and Space Engineering, Hokkaido University —
The resonant gas oscillation excited in a finite one-dimensional space between an oscillating plate (sound source) and a vapor-liquid interface is studied. In particular, we focus on the case where the vapor is a polyatomic gas, e.g. water vapor, the liquid is its own condensed phase and no other species of molecules are existent in the space. The behavior of the gas accompanied with the evaporation and condensation at the interface is analyzed by applying the asymptotic theory for $\mathrm{Kn} \ll \mathrm{M} \ll 1$ to the polyatomic version of Gaussian-BGK Boltzmann equation, where Kn is the Knudsen number defined by the ratio of the mean free path of gas molecules and M is the Mach number defined by the ratio of the maximum speed of oscillating plate to the sound speed. The result shows that the gas region consists of the three regions of that governed by wave equation, the thermal boundary layer and the Knudsen layer.

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