CHAPTER V

CONCLUSION AND DISCUSSION

In this thesis, we used the Ziman theory [8] to calculate the electrical conductivity of liquid metallic hydrogen. In our work, we created a model of degenerated electron gas mixed with ions. The pseudopotential between the ions and the conduction electron was taken to be the screened Coulomb potential proposed in Ref. [19]. As for the radial distribution function, we used two forms of this function obtained by using two different methods under different conditions. The first one was taken from the paper by Xu and Hansen [9] in which the authors employed the density functional theory to obtain the radial distribution function at a fixed temperature but at various electron concentrations. The second one was taken from the work by Weir, Mitchell, and Nellis [5] in which the authors used the molecular dynamics simulation to obtain the radial distribution function at a fixed electron concentration but at various temperatures. Using these functions in our model, we calculated the electrical conductivity of liquid metallic hydrogen using the numerical methods. Our result agrees with the experimental data presented in Ref.[6].

Our model however does not include the phonon effects [21] that should exist in this hydrogen system and are embedded in the pseudopotential [8]. Anyway, that our result agrees with experiment might be due to the fact that the pseudopotential is very weak and therefore can be neglected.

Another important remark is that the authors of Refs. [9] and [22] did not work out the radial distribution function for the model of mixed H_2-H_2 molecules or H-H_2 molecules that should exist at the critical pressure and temperature. In the accurate calculation of the electrical conductivity of this metal, we therefore cannot ignore this effect. This issue deserves further investigation in the future.