**Shanghai Jiao Tong University**

**University of Michigan – Shanghai Jiao Tong University Joint Institute**

**Thesis Title Thesis Title Thesis Title Thesis Title   
Thesis Title**

## Thesis Subtitle (Optional)

by

**Author**

A thesis submitted in partial satisfaction of the

requirements for the degree of Doctor of Philosophy/Master of Science in

Electrical and Computer Engineering at Shanghai Jiao Tong University

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| **Committee in charge:** | **Shanghai** |
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| **Committee member 4** |  |
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**论文子标题（可选）**

**作者**

上海交通大学密西根学院博士/硕士学位论文

电子与计算机工程专业

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Abstract

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**关键词：**关键词一；关键词二；关键词三；关键词四；关键词五

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Nomenclature

|  |  |
| --- | --- |
| Symbols | |
|  | Symmetry coefficient |
|  | Free energy of adsorbed hydrogen atom |
|  | Hydrogen adsorption energy |
|  | Hamiltonian operator |
|  | Wave function of nuclei |
|  | Single-electron wave function |
| Abbreviations | |
| DFT | Density functional theory |
| GGA | Generalized gradient approximation |
| HER | Hydrogen evolution reaction |
| LDA | Local density approximation |
| MGI | Materials genome initiative |
| ML | Machine learning |

# Introduction

* 1. This Is a Section

In a weakly collisional plasma with a single ion species, where the ion collisional mean free path is significantly larger than the Debye length, a presheath develops in the plasma and ions are accelerated to the Bohm speed (ion sound speed) at the presheath-sheath edge ([Sánchez-Palencia et al. 2022](#_ENREF_5))

where is the electron temperature and is the ion mass. This condition is commonly referred to as the Bohm criterion). For multiple-ion species a generalized Bohm criterion has been derived by Riemann:

Here the sum is over the number of ion species, is the ion drift velocity at the presheath-sheath edge, is the ion density, is the electrons density, and the equality is usually assumed. However, this criterion leads to an infinite number of possible solutions and does not provide a prescription of the velocities of individual ion species at the sheath edge. Two simple solutions are apparent. First, all ions reach the sheath edge with the same velocity, the ion sound speed of the system. Second, each ion species has its own Bohm speed at the sheath edge. Two simple solutions are apparent. First, all ions reach the sheath edge with the same velocity, the ion sound speed of the system. Second, each ion species has its own Bohm speed at the sheath edge ([Fang et al. 2022](#_ENREF_1)).

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[Mohammed Salman et al. (2024)](#_ENREF_4) find that in a weakly collisional plasma with a single ion species, where the ion collisional mean free path is significantly larger than the Debye length, a presheath develops in the plasma and ions are accelerated to the Bohm speed (ion sound speed) at the presheath-sheath edge.

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[Griesemer et al. (2023)](#_ENREF_2) summarize the most recent advancements in applying ML methodologies in predicting materials stability, focusing particularly on predictions of zero- and finite-temperature stability. In a weakly collisional plasma with a single ion species, where the ion collisional mean free path is significantly larger than the Debye length, a presheath develops in the plasma and ions are accelerated to the Bohm speed (ion sound speed) at the presheath-sheath edge ([Sandeep 2020](#_ENREF_6)).

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# Background Theory

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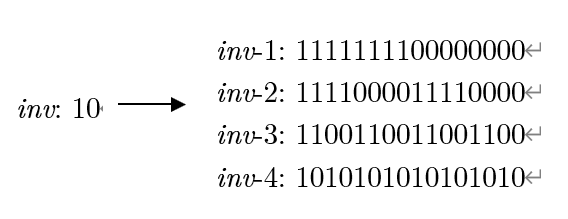


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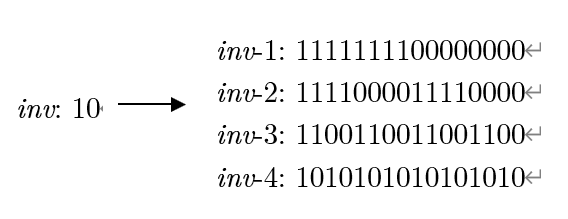


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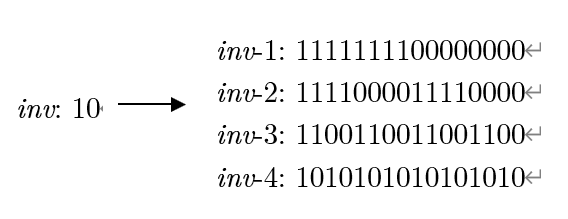


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In a weakly collisional plasma with a single ion species, where the ion collisional mean free path is significantly larger than the Debye length, a presheath develops in the plasma and ions are accelerated to the Bohm speed (ion sound speed) at the presheath-sheath edge.

# Methodology

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This is a text about the main subject. It can be contained in more than one chapters. References can be cited either directly or indirectly as did ([Fang et al. 2022](#_ENREF_1)). To have more than one reference in the reference list, I want to cite [Aydil and](#_bookmark18) [Economou](#_bookmark18) ([1992](#_bookmark18)) just for the demonstration.

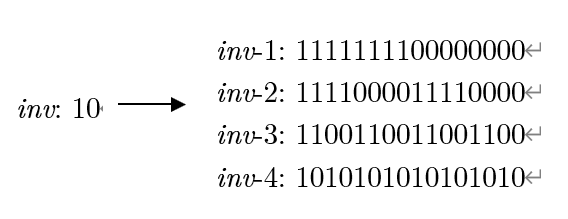


Figure 3.1: An example figure. Figure caption should be put below the figure.

Table 3.1: An example table. The table caption should be put above the table.

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* 1. This Is a Section

In a weakly collisional plasma with a single ion species, where the ion collisional mean free path is significantly larger than the Debye length, a presheath develops in the plasma and ions are accelerated to the Bohm speed (ion sound speed) at the presheath-sheath edge

where is the electron temperature and is the ion mass. This condition is commonly referred to as the Bohm criterion. For multiple-ion species a generalized Bohm criterion has been derived by [Fang et al. (2022)](#_ENREF_1):

where the sum is over the number of ion species, is the ion drift velocity at the presheath-sheath edge, is the ion density, is the electrons density, and the equality is usually assumed. However, this criterion leads to an infinite number of possible solutions and does not provide a prescription of the velocities of individual ion species at the sheath edge. Two simple solutions are apparent. First, all ions reach the sheath edge with the same velocity, the ion sound speed of the system. Second, each ion species has its own Bohm speed at the sheath edge. Two simple solutions are apparent. First, all ions reach the sheath edge with the same velocity, the ion sound speed of the system. Second, each ion species has its own Bohm speed at the sheath edge.

* + 1. This Is a Sub-section

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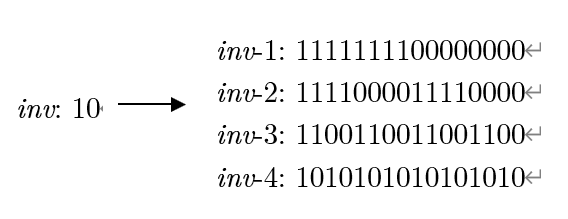


Figure 3.2: An example figure. Figure caption should be put below the figure.

# Conclusions and Outlook

* 1. Conclusions

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Contributions: A bullet list of contributions.

* 1. Outlook

Outlook: Suggestions of future work.

# Bibliography

Fang, Xiaomin, Lihang Liu, Jieqiong Lei, Donglong He, Shanzhuo Zhang, Jingbo Zhou, Fan Wang, Hua Wu, and Haifeng Wang. 2022. "Geometry-enhanced molecular representation learning for property prediction." *Nature Machine Intelligence* 4 (2): 127-134.

Griesemer, Sean D., Yi Xia, and Chris Wolverton. 2023. "Accelerating the prediction of stable materials with machine learning." *Nature Computational Science* 3: 934-945.

Hashim, Mohamad Mohshein, Noraini Marsi, Anika Zafiah Mohd Rus, Nur Sahira Marhaini Sharom, and Asmadi Md Said. 2023. "Natural Fiber of Palm Empty Fruit Bunches (PEFB) Reinforced Epoxy Resin as Polymer Composites." In *Structural Integrity and Monitoring for Composite Materials*, edited by Ahmad Hamdan Ariffin, Noradila Abdul Latif, Muhammad Faisal bin Mahmod and Zaleha Binti Mohamad, 213-242. Singapore: Springer Nature Singapore.

Mohammed Salman, K., M. Zikriya, and C. G. Renuka. 2024. "Wide band gap tuning of Mg doped ZnO thin films for optoelectronic applications." *IOP Conference Series: Materials Science and Engineering* 1300 (1): 012026.

Sánchez-Palencia, Pablo, Said Hamad, Pablo Palacios, Ricardo Grau-Crespo, and Keith T. Butler. 2022. "Spinel nitride solid solutions: charting properties in the configurational space with explainable machine learning." *Digital Discovery* 1: 665-678.

Sandeep, K. 2020. "Ionic transport properties of Mg2Ti2Zr5O16functional material." AIP Conference Proceedings.

# Appendix A

Title of the Appendix

This could be some matter of the thesis that may not be convenient to include in the main matter, e.g. program code, long tables, etc.

# Appendix B

Title of second Appendix

This could be some matter of the thesis that may not be convenient to include in the main matter, e.g. program code, long tables, etc.

# Publication List

Note: This shows the format for the stage of anonymous review. In the final submission, follow the format of the Bibliography.

Journal papers

1. **First author**. 2021. *Journal of The Electrochemical Society.*
2. **Third author**. 2019. *Journal of The Electrochemical Society.*

Conference papers

1. **First author**. 2004. *Proceedings of the 1st International Tourism and Media Conference*.
2. **Third author**. 2019. *Proceedings of the Fifteenth Annual Meeting of the Berkeley Linguistics Society: General Session and Parasession on Theoretical Issues in Language Reconstruction.*

# Acknowledgments

Here you may thank whomever you like. Remember to thank any funds that may have provided financial support for the thesis. Note that this chapter is not numbered.

You may write the acknowledgements in English or both English and Chinese. If both languages are used, the texts do not need to be equivalent.

致谢主要感谢导师和对论文工作有直接贡献和帮助的人士和单位。致谢言语应谦虚诚恳，实事求是。致谢可用英语或中英双语。如使用中英双语，内容不需要对应。