

# Physics of Thermal Plasmas at Atmospheric Pressure

## PROJECT DESCRIPTION

"The ultimate goal of this work is to predict the properties of thermal plasmas at atmospheric pressure. This type of plasmas is crucial for technological applications such as welding, circuit breakers, cutting tools, and more. Despite their importance, they currently cannot be treated with engineering tools such as formulae or tabulated data.

This project will focus on modeling the coupled physics in the welding arc, with a focus on providing a general quantitative set of formulas and tabulated data useful both in research and industry. Such work will generalize current data that is currently unconnected and of little use in industry or research. This work will benefit much from current collaborations with the Department of Physics and projects with partner companies.

In this project students will learn the theory behind these plasmas, and become familiar with foundational and current literature on thermal plasmas. Students will also have direct access to thermal plasmas produced at currents up to 1000 A and to high-quality plasma spectrometry equipment.

A very high impact is expected from this work, as it will be the first time the arc and the influence of different gases are properly considered in a general way, amenable to industrial implementation in the form of simple formulae for the engineers, and tables and graphs for the practitioners.

Required skills for this project include having passed an introduction to fluid mechanics, introduction to heat transfer, introduction to electromagnetism, basic use of Microsoft Excel, self-motivation, natural curiosity, patience, and ability to act on feedback from the supervisor.

Desirable skills for this project include the ability to write code (e.g. Matlab), and previous experience on heat transfer, fluid flow, or plasmas."

## FACULTY-DEPARTMENT

Engineering- Chemical and Material Engineering

## DESIRED FIELD OF (STUDENT) STUDY

Chemical Engineering, Mechanical Engineering, Materials Engineering, Mathematics, Physics, Computer Science or Engineering. Other fields welcome

## INTERNSHIP LOCATION

University of Alberta Main Campus - Edmonton

Contact: Brendan Cavanagh, Internship Coordinator (Inbound)  
University of Alberta International  
intern@ualberta.ca

NUMBER OF INTERNSHIP POSITIONS

1

INTERNSHIP START DATE

July 4

INTERNSHIP END DATE

3 months after start date

ARE THE DATES FLEXIBLE?

Yes, I am flexible regarding the internship dates. Selected students can contact me to request a date change.