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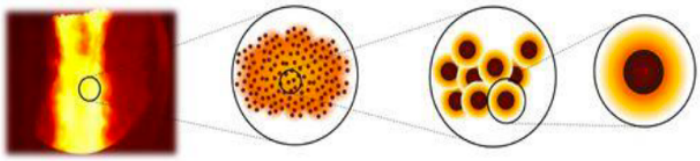
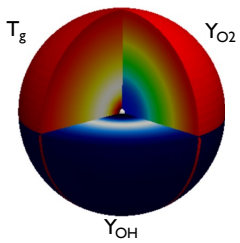
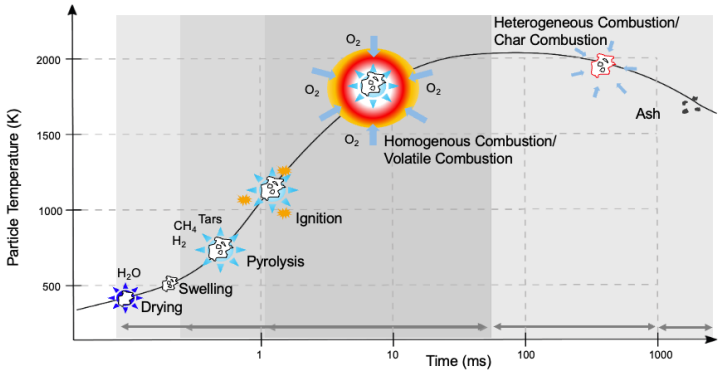
Master thesis



Investigation of the ignition and combustion of pulverized solid fuels in oxy-fuel atmospheres

Enhancing the efficiency of a solid fuel-powered powerplant on a large scale requires an understanding of the physics of ignition and combustion on a particle scale is necessary. Recently, increasing combustion efficiency by reducing pollutant emissions and CO2 capture by using oxy-fuel combustion for solid fuels has been the main focus of solid fuel combustion research.
When solid fuel particles are exposed to heat, the internal chemical bonds inside the particle structure break, and as a result, gas-phase volatile species are released, which then, by reacting with the oxidizer, lead to ignition and volatile combustion. The remaining char also react at the surface with the oxidizer, leading to char burnout. The complete process is shown in the following figures.
Since solid particle combustion is a transient and multiphase phenomenon, simulations require detailed models to describe these fuels' behavior under combustion conditions. Our research team aims to study this transient behavior in different conditions using fully resolved simulations and provide accurate models for improving large-scale simulations. Therefore, modeling the ignition, combustion, and pollutant formation of solid fuels such as biomass is the main focus of this project.





Your Tasks:

- Developing a numerical framework to predict ignition, combustion, and pollutant formation for solid pulverized fuels.
- Working with solid kinetic and gas-phase kinetics to predict solid particle ignition and combustion.
- Performing a comprehensive parametric study in different configurations to find the model for flame location around the burning particles.

Ideal candidate should:

- Have a basic understanding of combustion or eager to learn fast.
- Be interested and familiar with C++ programming.
- Be familiar with Linux basics.
- Have good communication skills and teamwork spirit.

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