

ADP

Design and construction of a reactor for aluminium droplet combustion in steam for green H₂ and power generation

Motivation & Background

Aluminum–steam combustion is a promising carbon-free energy concept that enables simultaneous heat release and hydrogen production without CO₂ emissions. Owing to its high energy density, long-term storability, and recyclability, aluminum is an attractive metal fuel for green power generation. However, the fundamental combustion behavior of aluminum droplets in steam-rich environments is still not well understood under controlled flow and temperature conditions.

This advanced design project aims to design and set up a novel aluminum droplet generation burner to enable systematic studies of aluminum combustion in high-temperature steam. The developed burner will provide a controlled and well-defined platform for investigating droplet generation, combustion dynamics, and energy release, serving as an experimental basis for future research on aluminum-based clean energy systems.

Tasks

- Familiarization with aluminum combustion and pulse gas aluminum droplet generation system
- 3D geometry (Siemens NX) and control system (LabView etc.) design of the reactor
- Manufacture (by the institute workshop) and construction of the reactor
- Preliminary operation and optimization of the reactor

Focus areas

Experiment	● ● ●
Construction	● ● ○
Modeling	● ○ ○
Data analysis	● ● ○

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Start from

Now

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