# Effects of the thickness of the burner rim, the velocities of fuel and air on extinction limit of ammonia coaxial jet diffusion flame


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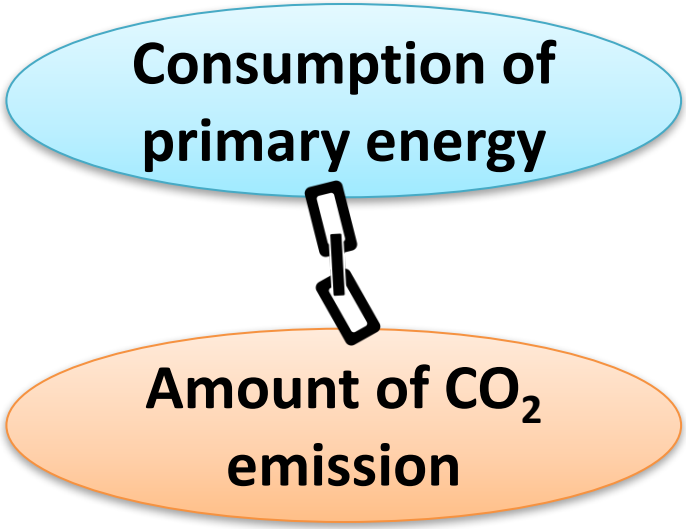
# Industrial furnaces could be "*door opener*" of ammonia fuel

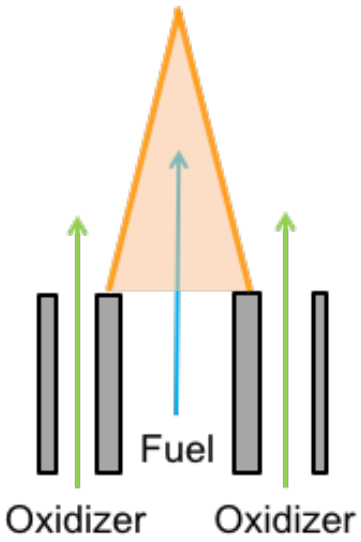
Consumption of primary energy in industrial sector accounts for around 45% of Japanese primary energy consumption including 7% from industrial furnaces.




**Ammonia is the attractive fuel for reducing $CO_2$ emission from industrial furnaces**

# Objective of this study

**Coaxial jet diffusion flame** is commonly used in the industrial furnaces (It can eliminate flash back)

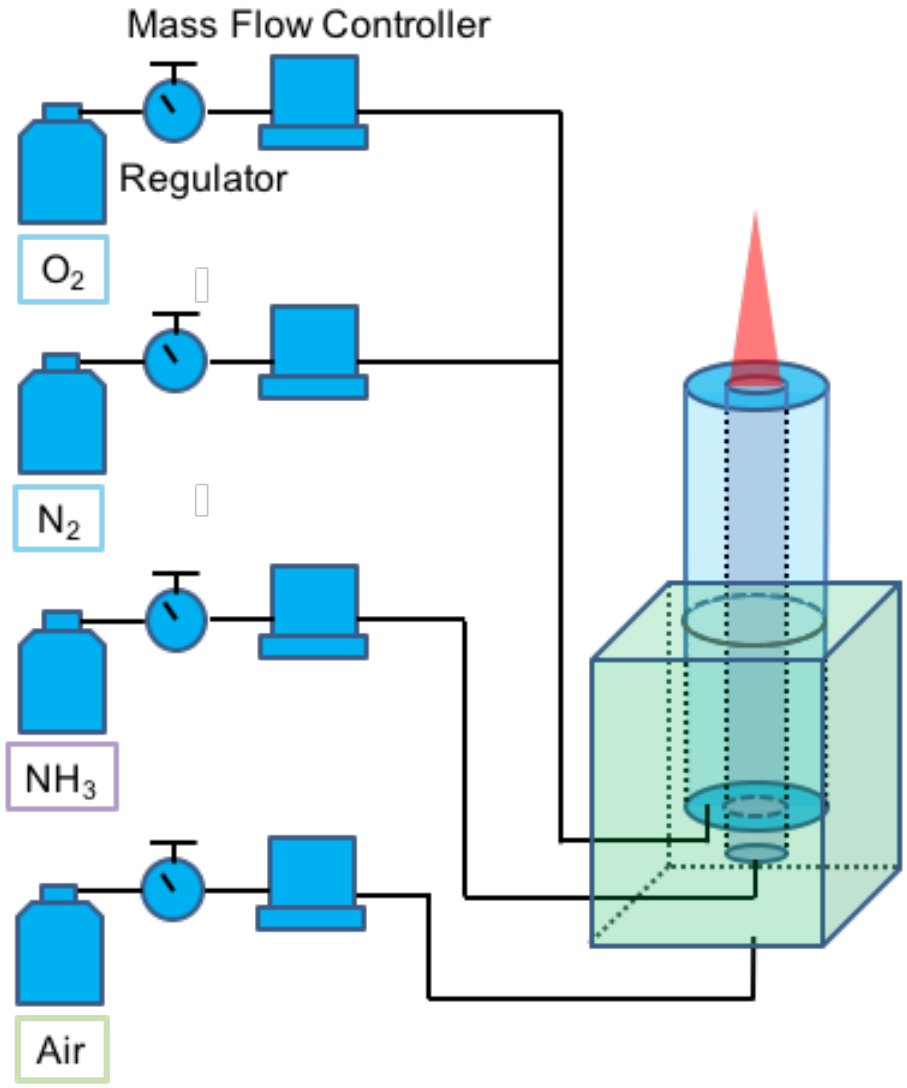


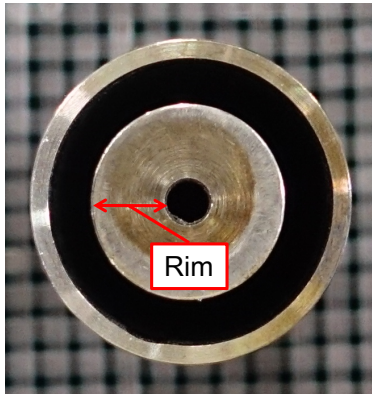

!!Problem!!
Ammonia flame cannot be stable
in commonly used burner configuration,
and in operation range for the fossil fuel.

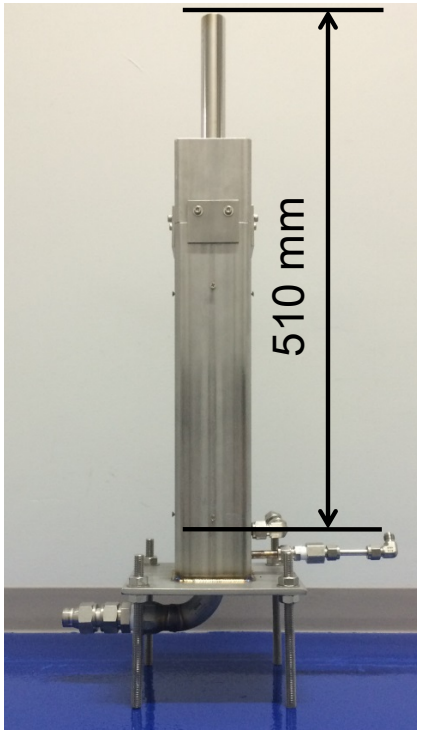
**Need to answer to key questions (= objective)**

**Which is the appropriate burner configuration?**
**How to expand the operation range?**

# Experimental apparatus



# Summary

**Which is the appropriate burner configuration?**

→ Need to take into account the physics of flame stability

**Increase $Da$ number**
**= Increase the thickness of burner rim (6.0 mm in this study)**
**= Increase the oxigen concentration of the oxidizer (>25%)**

**How to expand the operation range?**

→ Need to know extinction mechanism of ammonia flame

**There are three regions with different mechanism**

1) flow field / mixing dominant region
2) Stretch rate dominant region (reaction dominant)
3) Share stress dominant region