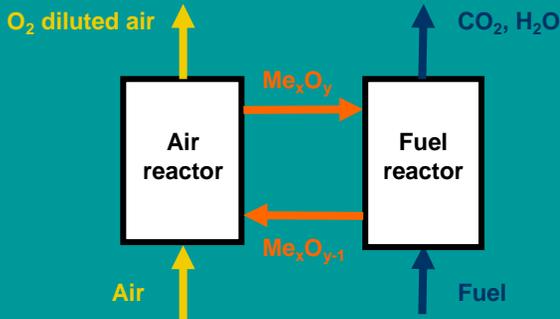


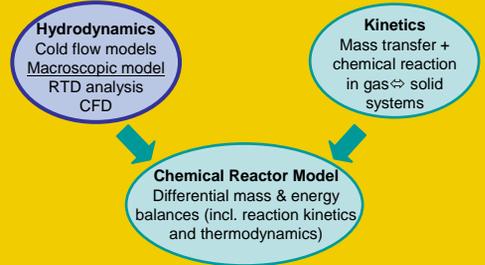
Chemical Looping Combustion of Natural Gas with CO₂ Capture: Macroscopic Fluid Dynamics Analysis

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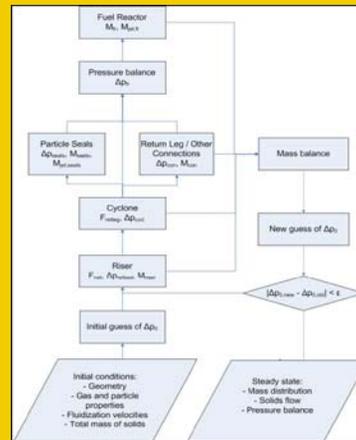
Chemical Looping Combustion



Modeling strategy



Model structure

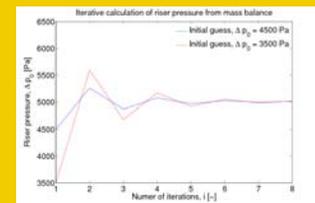


Model properties

- Implemented in MATLAB
- Flexible - object oriented

Model input

- geometry of the unit
- gas and particle properties
- operational parameters

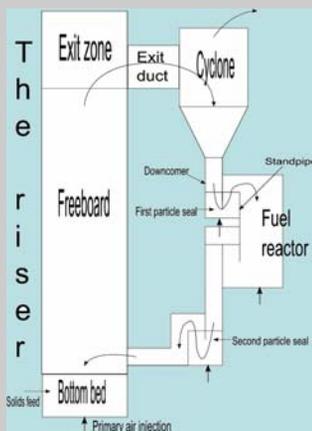


Circulating Fluidized Bed CLC test rig

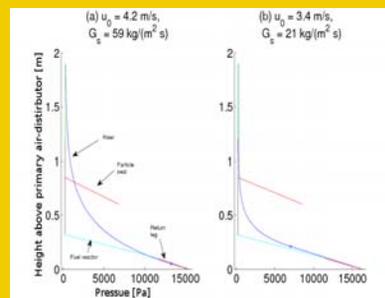
Cold flow laboratory unit



Discrete modeling zones



Modeling results

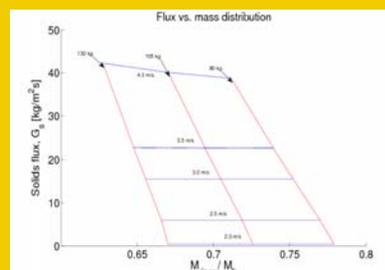


Iterative calculation

- pressure balance
- mass balance
- correlations for Δp

Pressure profile

- 2 fluidization velocities
- 105 kg total bed mass



Operational map

- Independent variables
- gas velocity riser
 - total mass of solids

Dependent variables

- solids flux
- mass distribution

Future work

Fluid dynamics

- Data from the cold flow unit:
- Pressure drop
 - Solids circulation rates
 - Distribution of solids

Later also RTD experiments:

- Mean residence time
- Residence time distribution

Kinetics

- Kinetic experiments
- Kinetic models

Reactor Model

- Fast fluidization & bubbling fluidization
- Simplified flow models
 - Mass & heat balances
 - Kinetics

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