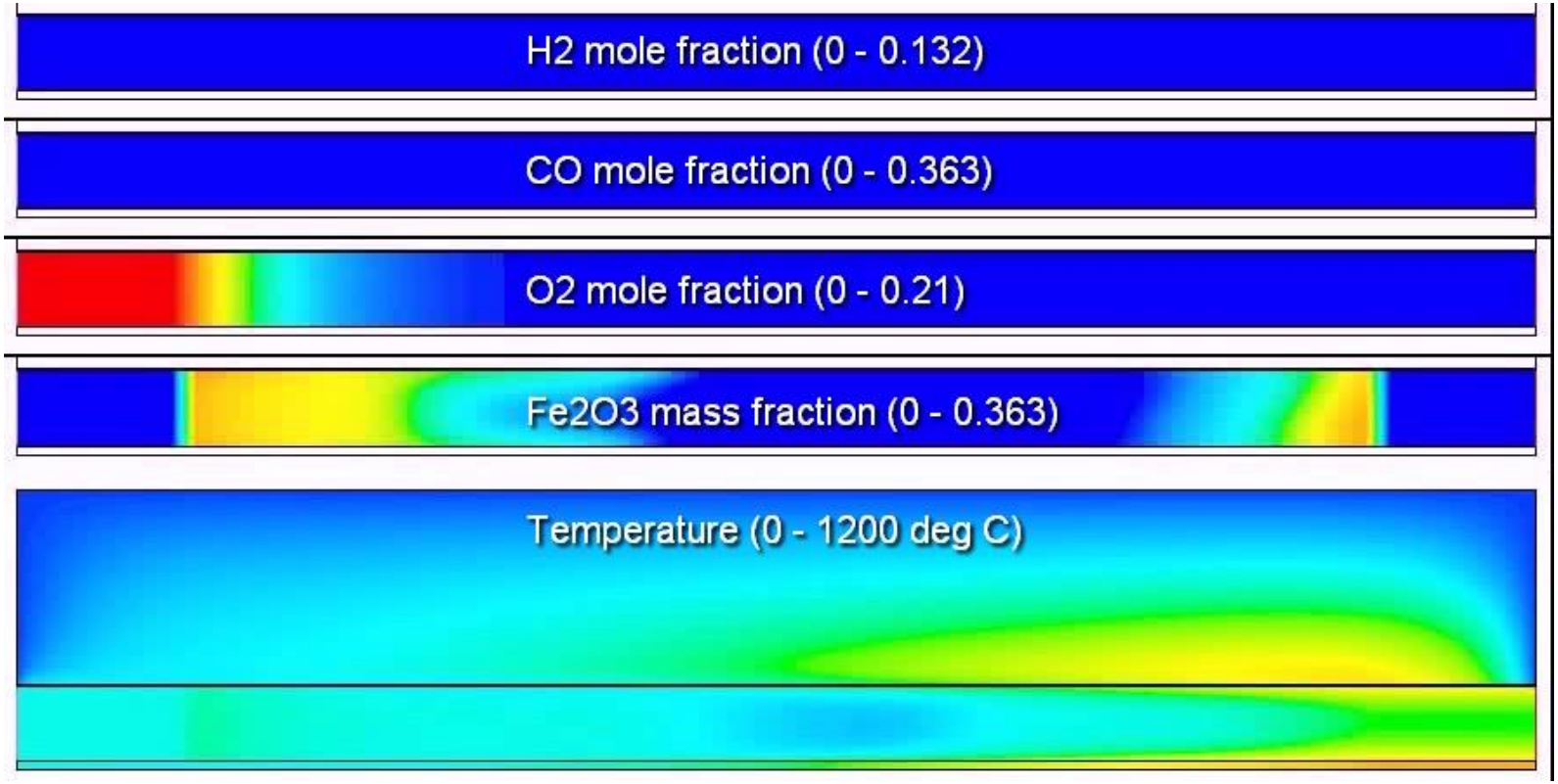
Chemical Looping activities
in the
Flow Technology group SINTEF
&
Energy and Process Technology department
NTNU

Scientific focus

- Technology development
  - Highly efficient and easily scalable reactor concepts for CO_2 capture
  - No conventional chemical looping combustion (CLC) projects
    - Dual fluidized bed CLC will be difficult to scale under pressurized conditions
  - Numerous alternative reactor projects based on the chemical looping principle
- Multiphase flow model development
  - Modelling tools are being developed to assist the design and further accelerate the scale-up process
- Outline in the next slides

Packed bed CLC

- DemoCLOCK EU FP7 project
- Packed bed: gas switching instead of chemical looping



Chemical switching reforming (CSR)

- Fluidized bed with perm-selective membranes for ultra-pure hydrogen production
- Switching mechanism for easy pressurization and scale-up

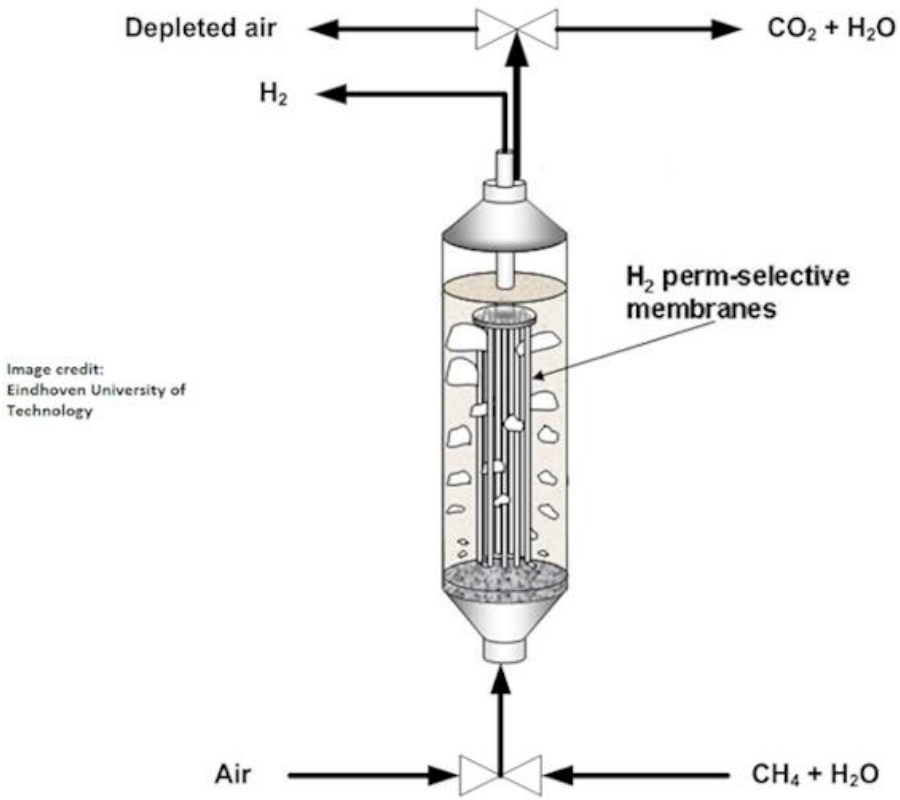
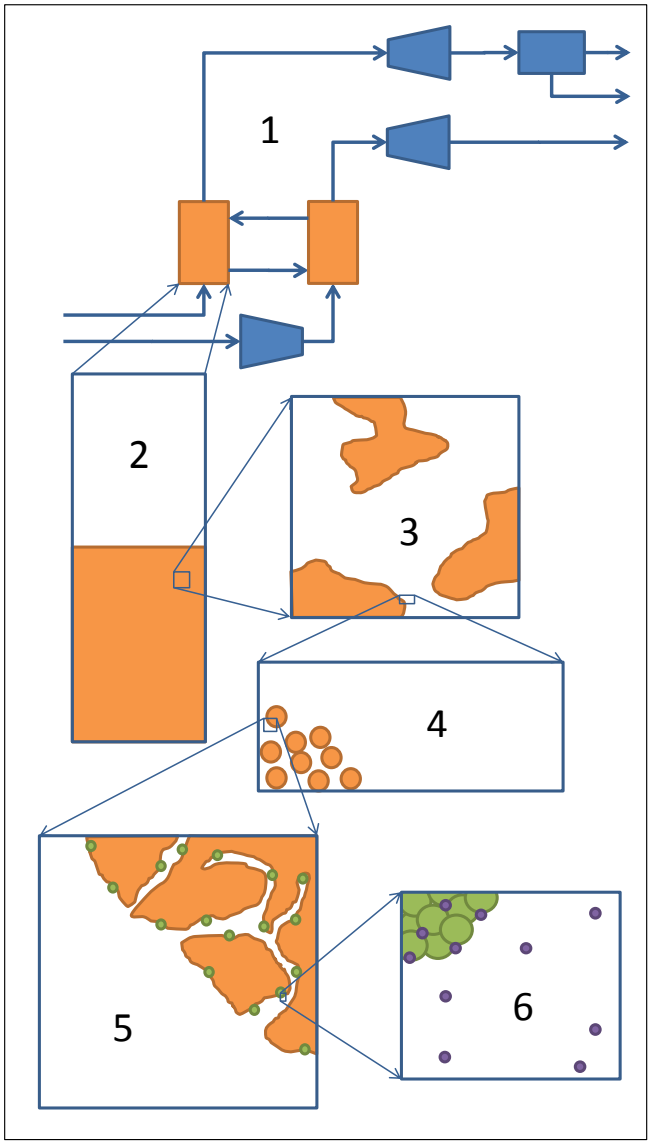


Image credit:
Eindhoven University of Technology

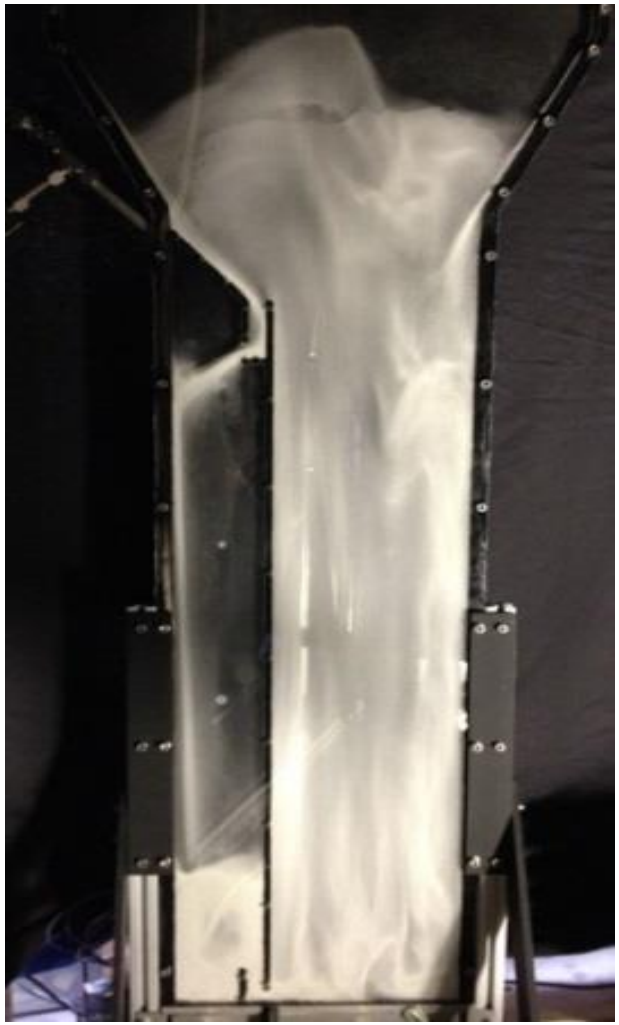
Chemical looping reforming (Nano)

- Intensified CLR process using nano-structured oxygen carrier materials
- Designed via a multiscale modelling approach

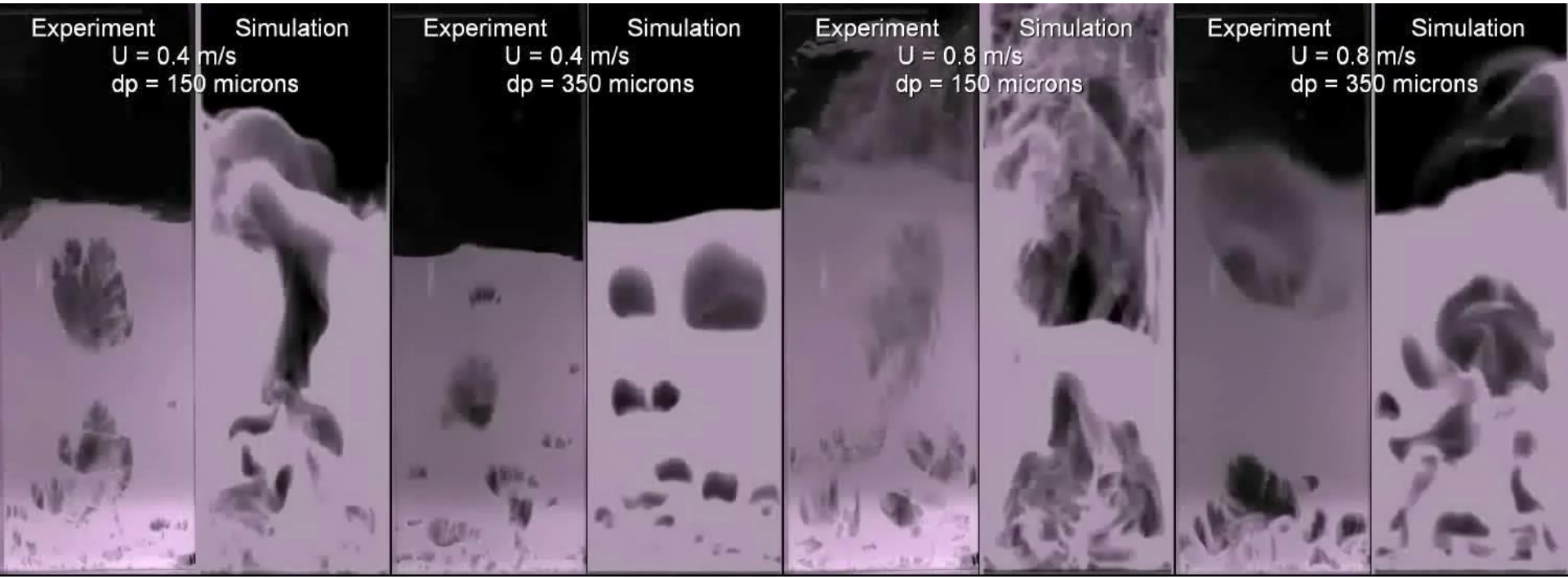


Internally circulating reactor

- Preserve the advantages of chemical looping in a one-piece unit for easy scale-up under pressurized operation
- Can be applied to all chemical looping concepts



Validated model development



The model is on the right in each of the four pairs of animations

Large scale model development

Simulation of 12 m circulating fluidized bed with cyclone and loop seal

Projects within Chemical Looping Combustion / Reforming

NanoSim	• EU funded project • Multiscale modelling framework • Hydrogen production with nano-structured catalysts
Chemical Switching Reforming	• Norwegian Research Council funded project • New concept – chemical switching with membrane insertion
DemoCLOCK	• EU funded project • Demonstration of packed bed CLC
COMPOSITE	• Norwegian Research Council funded project • New concept for high efficiency power production from solid fuels with CO_2 capture
Flow@CLC	• Norwegian Research Council funded project • Fundamental flow modelling of CLC process
ICR	• Norwegian Research Council funded project • New concept – Internally circulating reactor

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