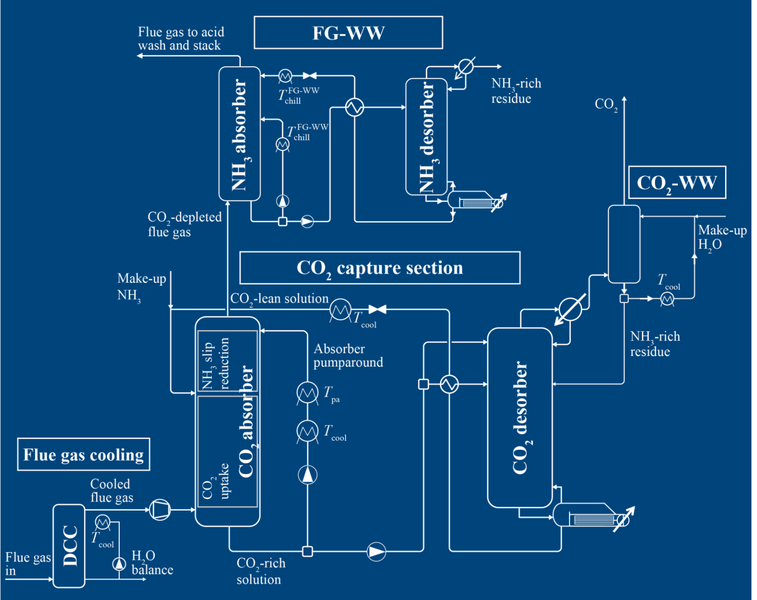
CEMCAP

CEMCAP is a Horizon 2020 project with the objective to prepare the grounds for cost- and resource-effective CCS in European cement industry.



The Chilled Ammonia Process (CAP)

- low-cost, chemically stable solvent
- competitive energy penalty
- demonstrated for various applications from NG power plants (4%vol CO_2) to coal-fired power plants (~15%vol CO_2) at different scales

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Chilled Ammonia Process

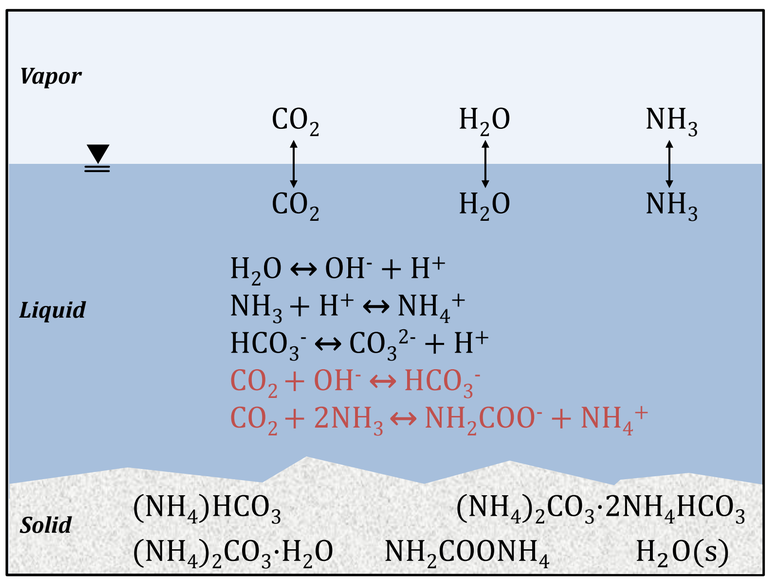
Application of the CAP to cement plant flue gas

- Adaptation of operating conditions to higher CO_2 concentration
- Thermodynamic and kinetic model extensions and development

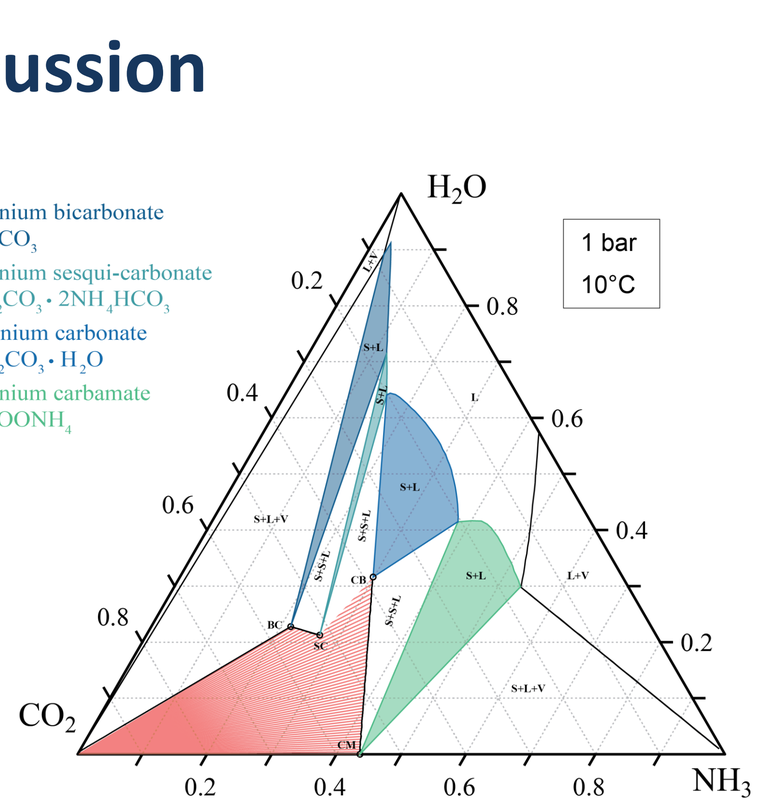
Conclusions after 2 years

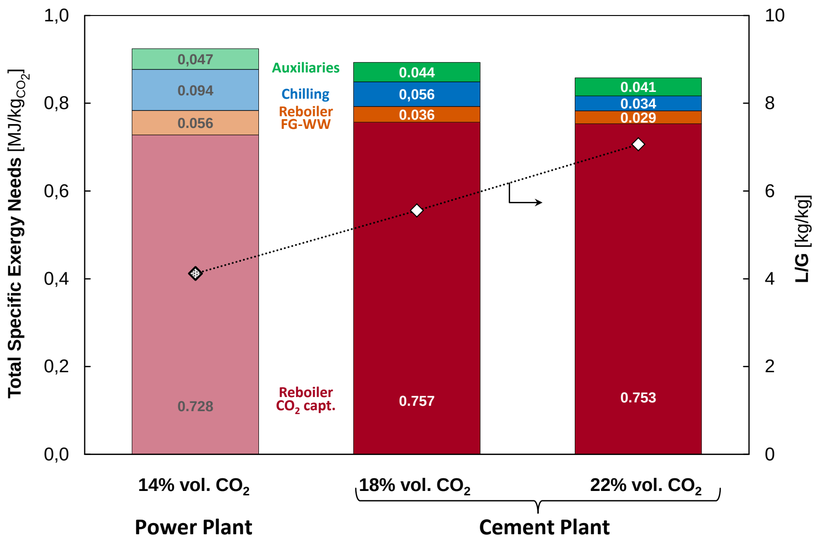
- Applicability of the CAP to cement plant flue gas proven
  - highly efficient capture exploiting the high CO_2 concentrations
  - tail-end application, i.e. retrofit possible, lower steam demand than amine-based capture processes
  - robust process performance even at high levels of SO_2 in flue gas
- Highly efficient CO_2 capture and resilience against flue gas impurities verified in comprehensive 1 t/day pilot tests
  - process models and experimental tests in remarkable agreement
  - further rate-based model development on-going

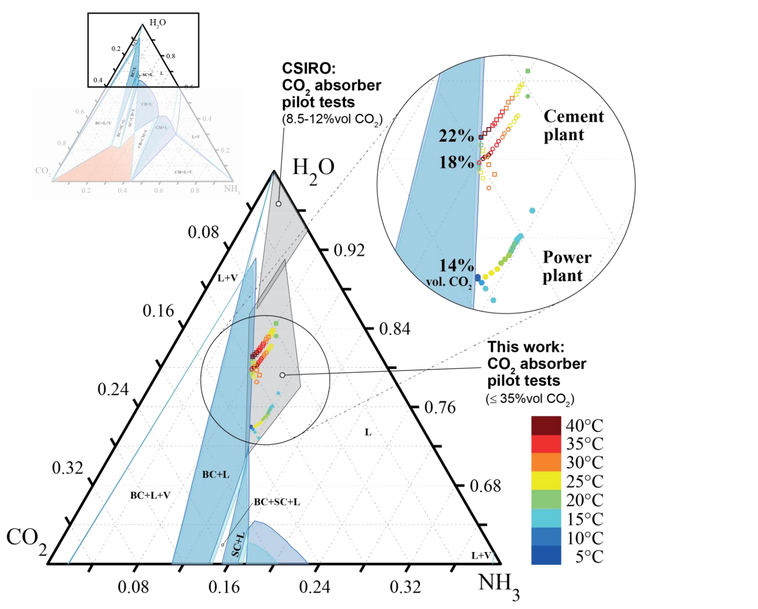
Results and discussion

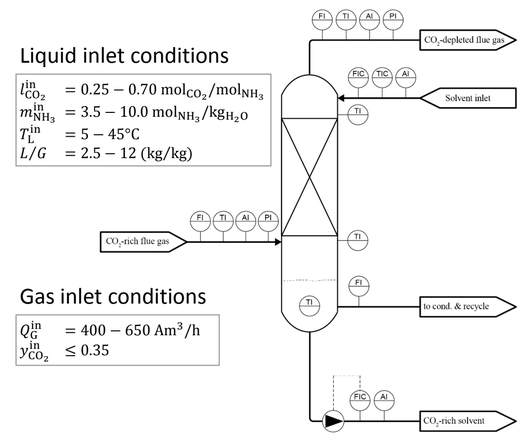


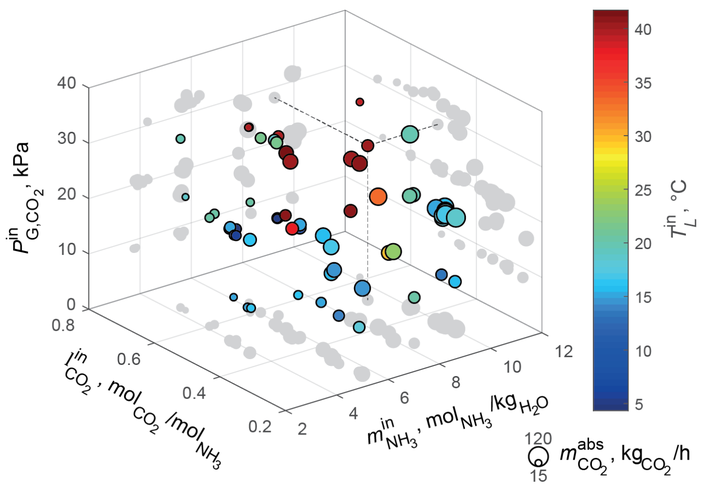
BC ammonium bicarbonate NH_4HCO_3
SC ammonium sesqui-carbonate $(NH_4)_2CO_3 \cdot 2NH_4HCO_3$
CB ammonium carbonate $(NH_4)_2CO_3 \cdot H_2O$
CM ammonium carbamate NH_2COONH_4

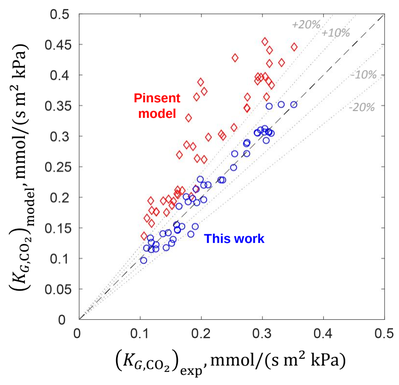












$$r_{cm} = k_{cm} C^{n}_{NH_3} C_{CO_2}$$

$$k_{cm} = k_{0cm,T_{ref}} \exp\left(-\frac{E_{a,cm}}{R}\left(\frac{1}{T} - \frac{1}{T_{ref}}\right)\right)$$

	$k_{cm}(T = T_{ref} = 298\ K)$ $\left[\frac{m^3}{kmol\ s}\right]$	$E_{a,cm}$ $\left[\frac{kJ}{kmol}\right]$	n [−]
This work	190	35300	1.3
Pinsent	431	48500	1