Eighth Annual Conference on Carbon Capture & Sequestration

Capture (Sorbents) 1

Experimental Investigation and Demonstration of the Sorption-Enhanced Water-Gas Shift Process

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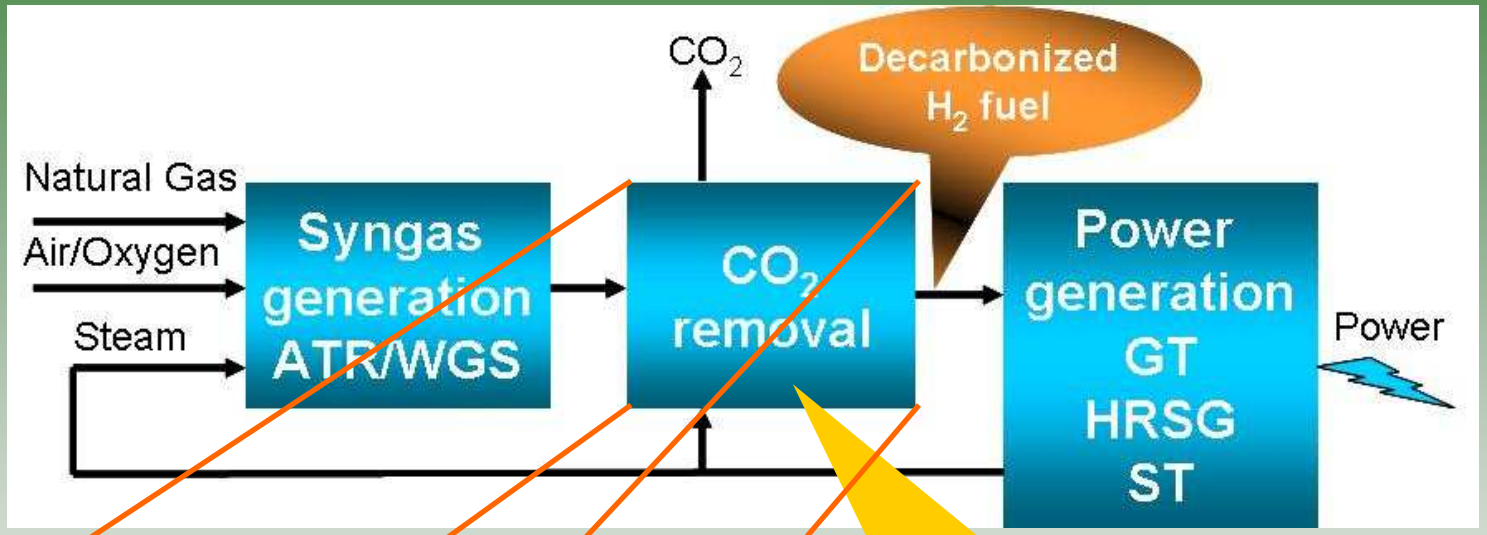
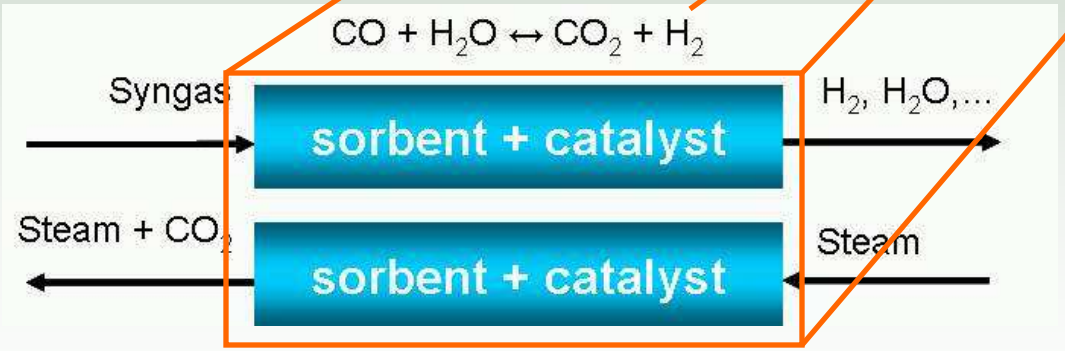
Sorption-Enhanced Water-Gas Shift (SEWGS)

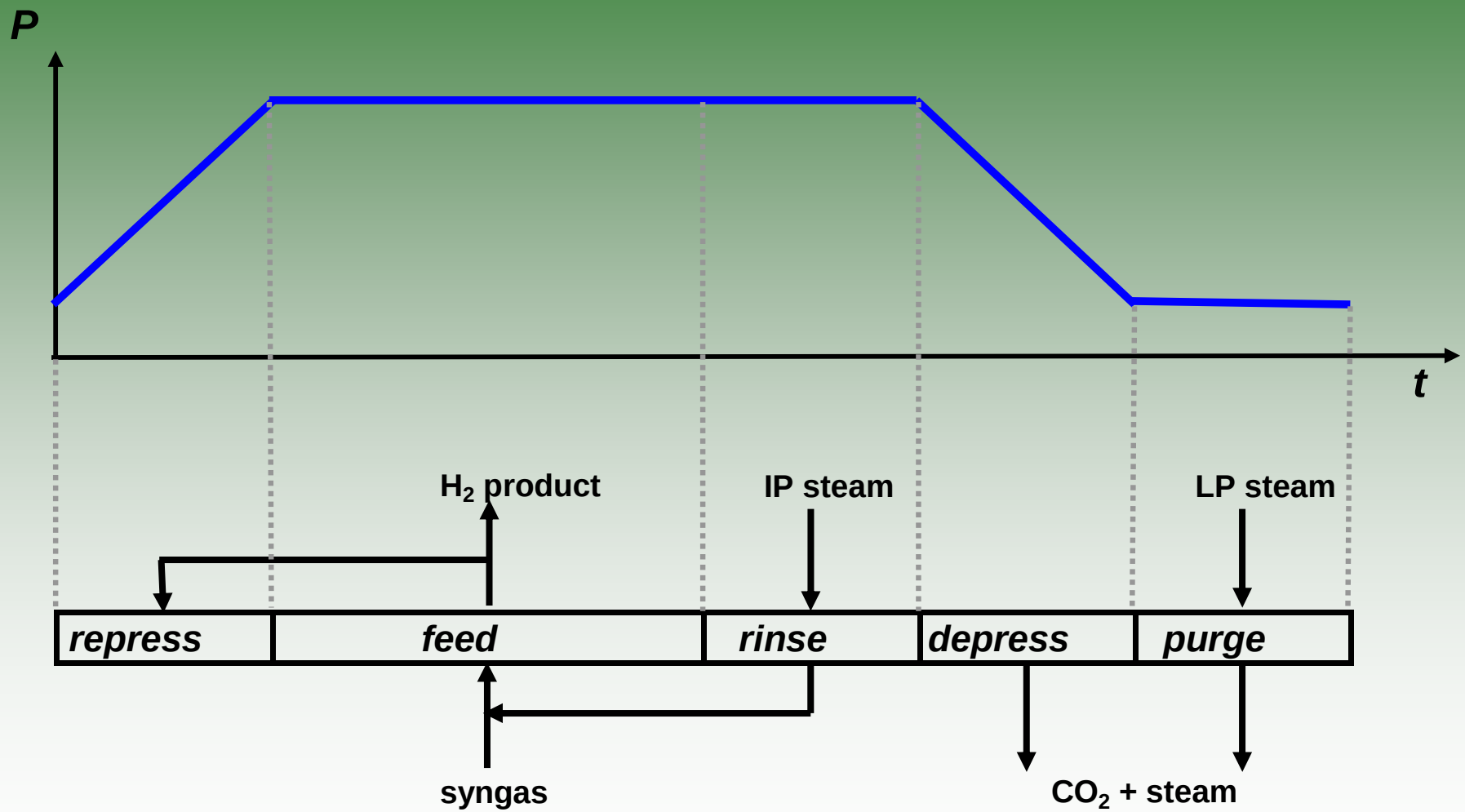




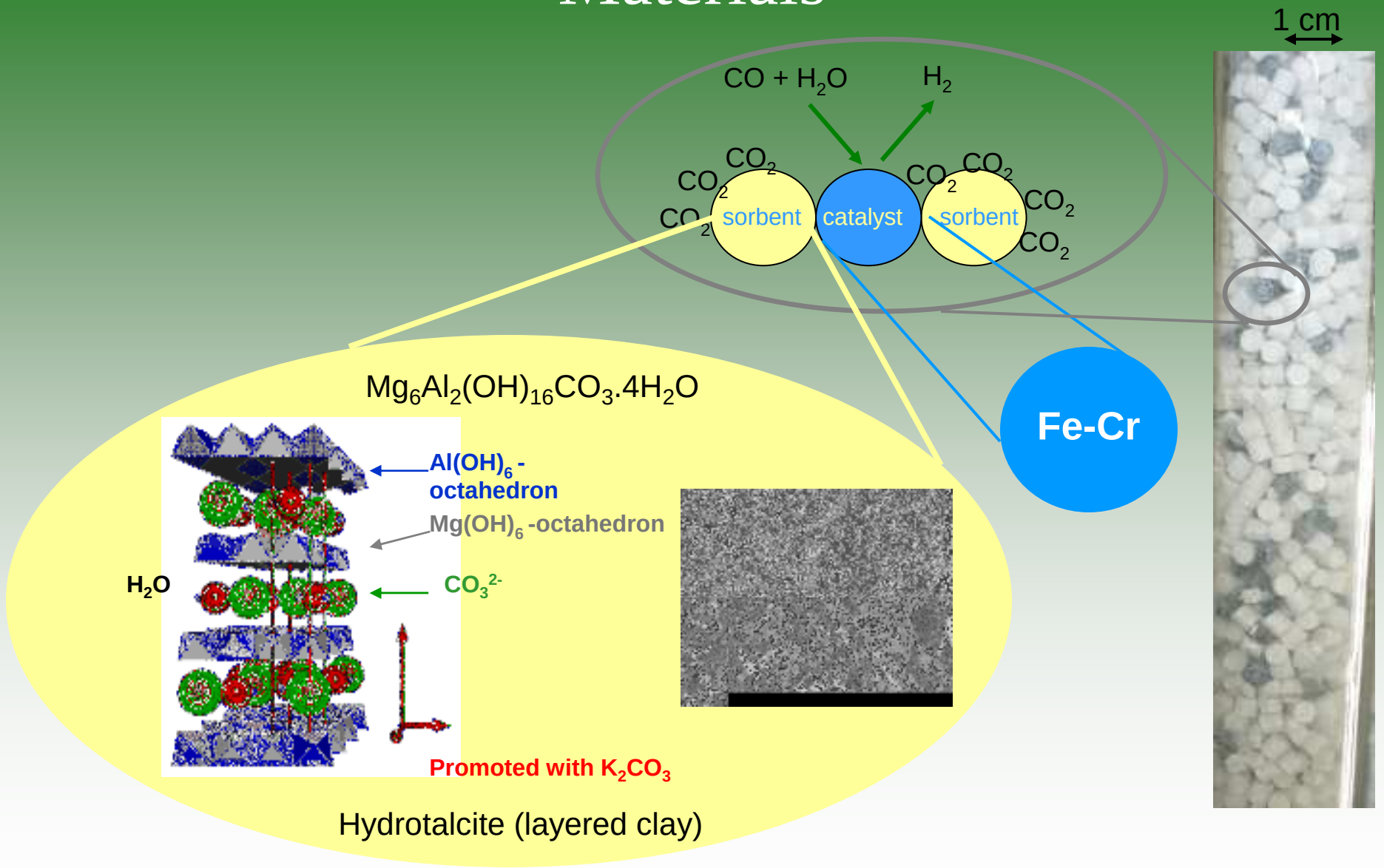
400 °C (752 °F), 30 bar (435 psi)

Hot separation
High H_2 recovery
High CO_2/CO rejection

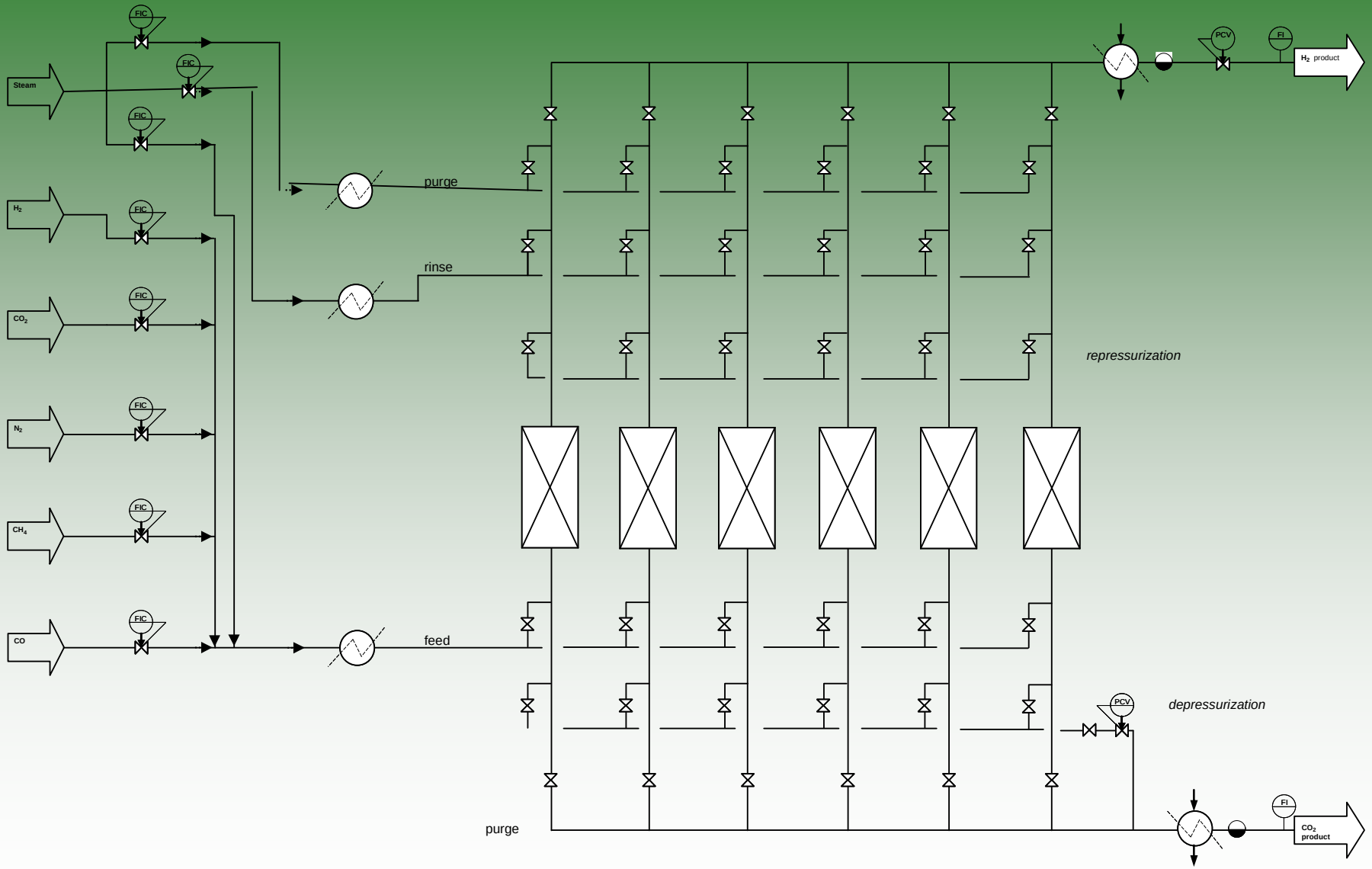
Pressure Swing Cycle



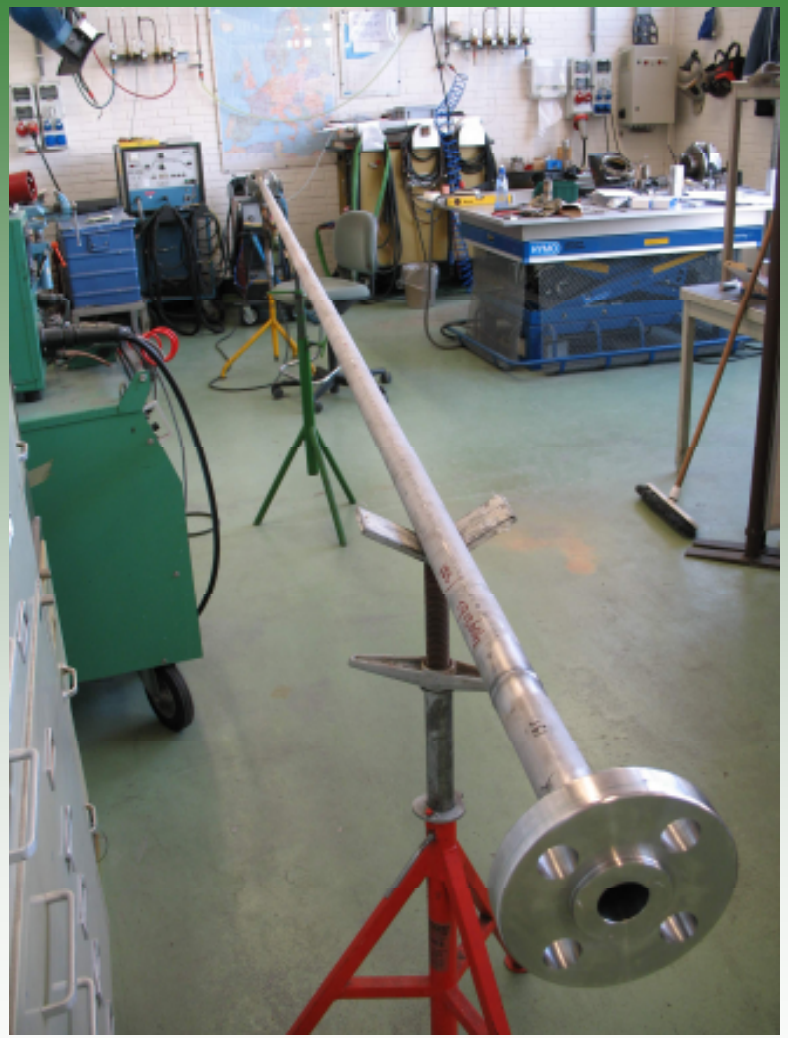
Materials


1 cm
CO + H2O
H2
CO2
CO2
CO2
CO2
CO2
CO2
sorbent
catalyst
sorbent
Fe-Cr
Mg6Al2(OH)16CO3.4H2O
Al(OH)6 - octahedron
Mg(OH)6 -octahedron
H2O
CO3 2-
Promoted with K2CO3
Hydrotalcite (layered clay)

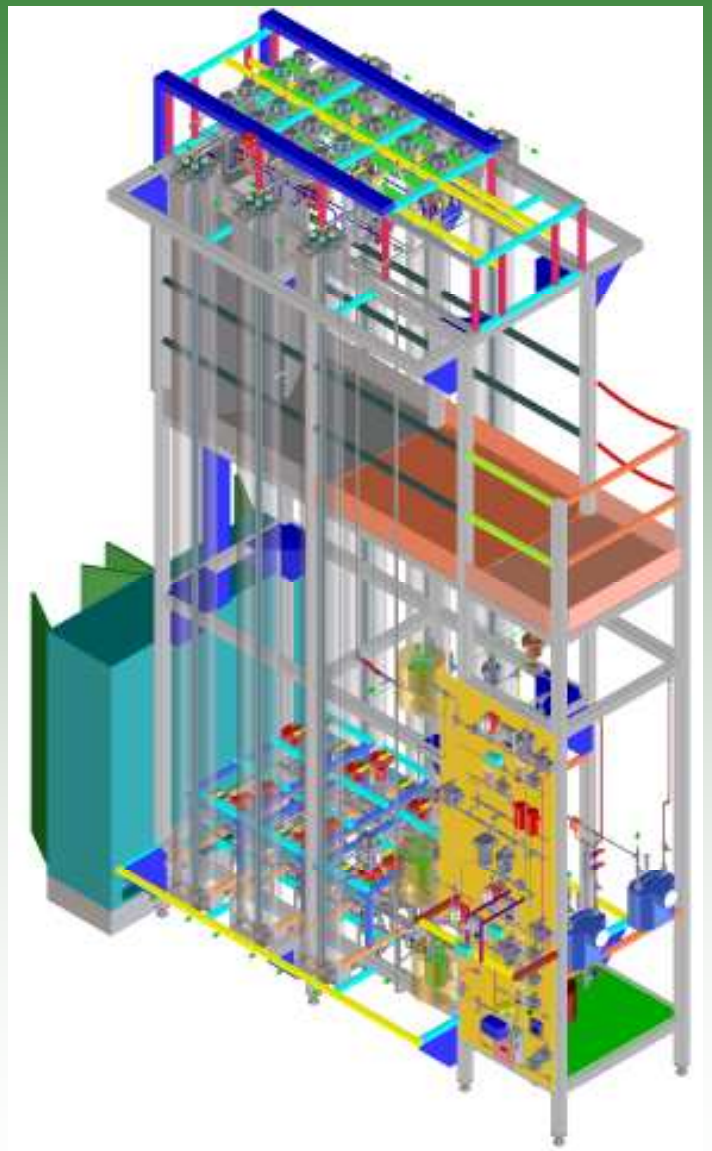
Lab-Scale Plant, Multiple Reactors



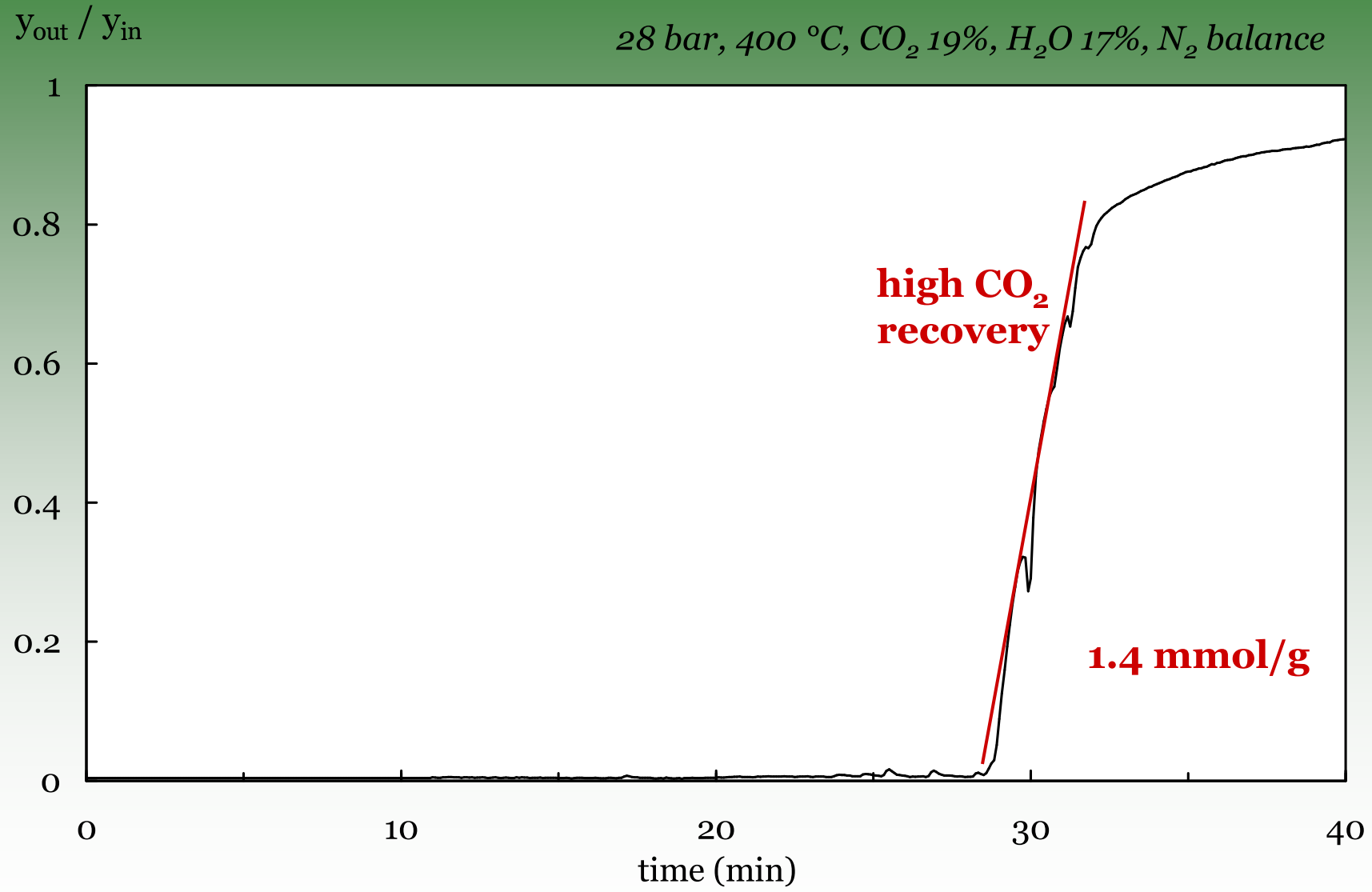
Construction



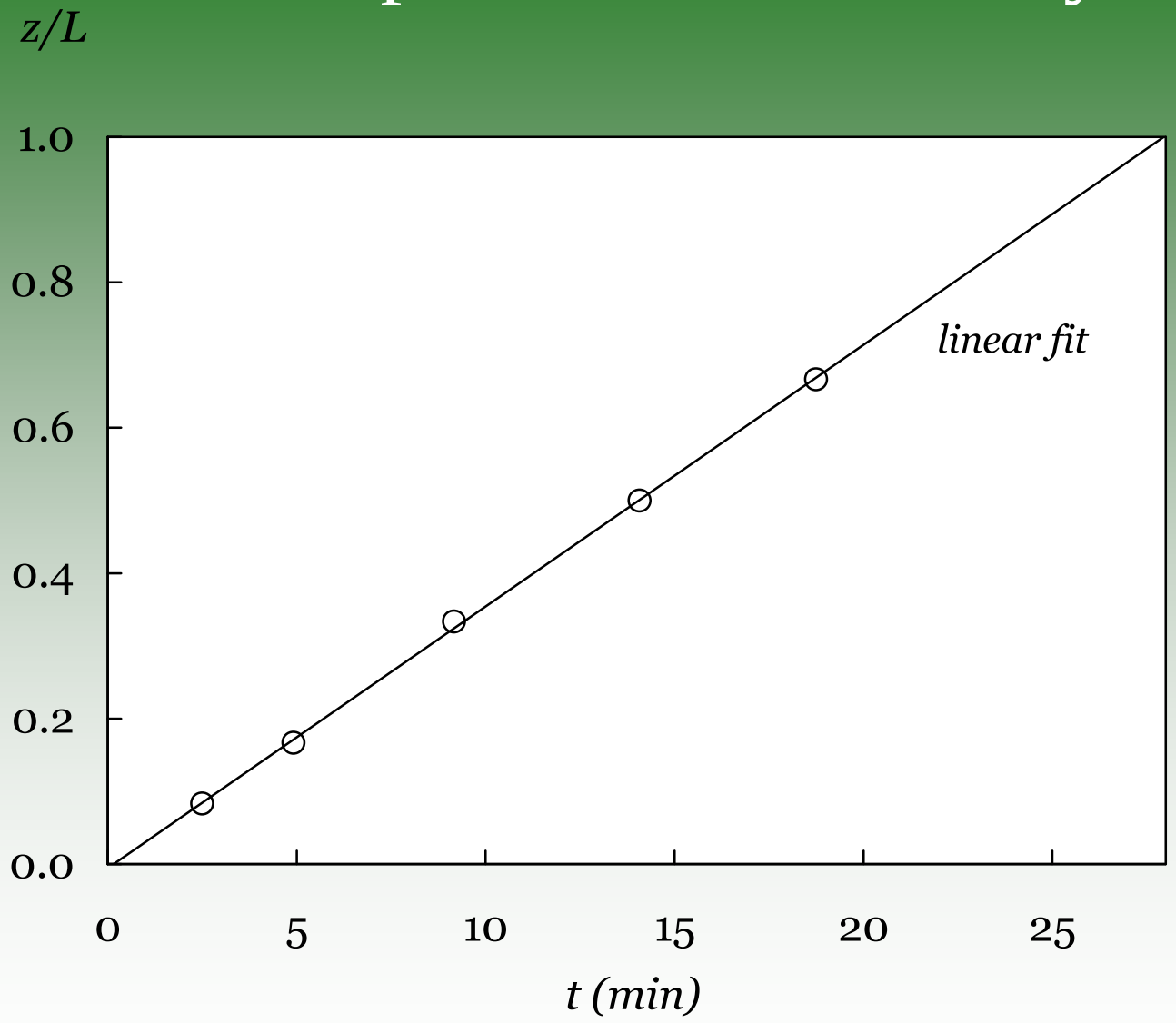
From Design to Commissioning



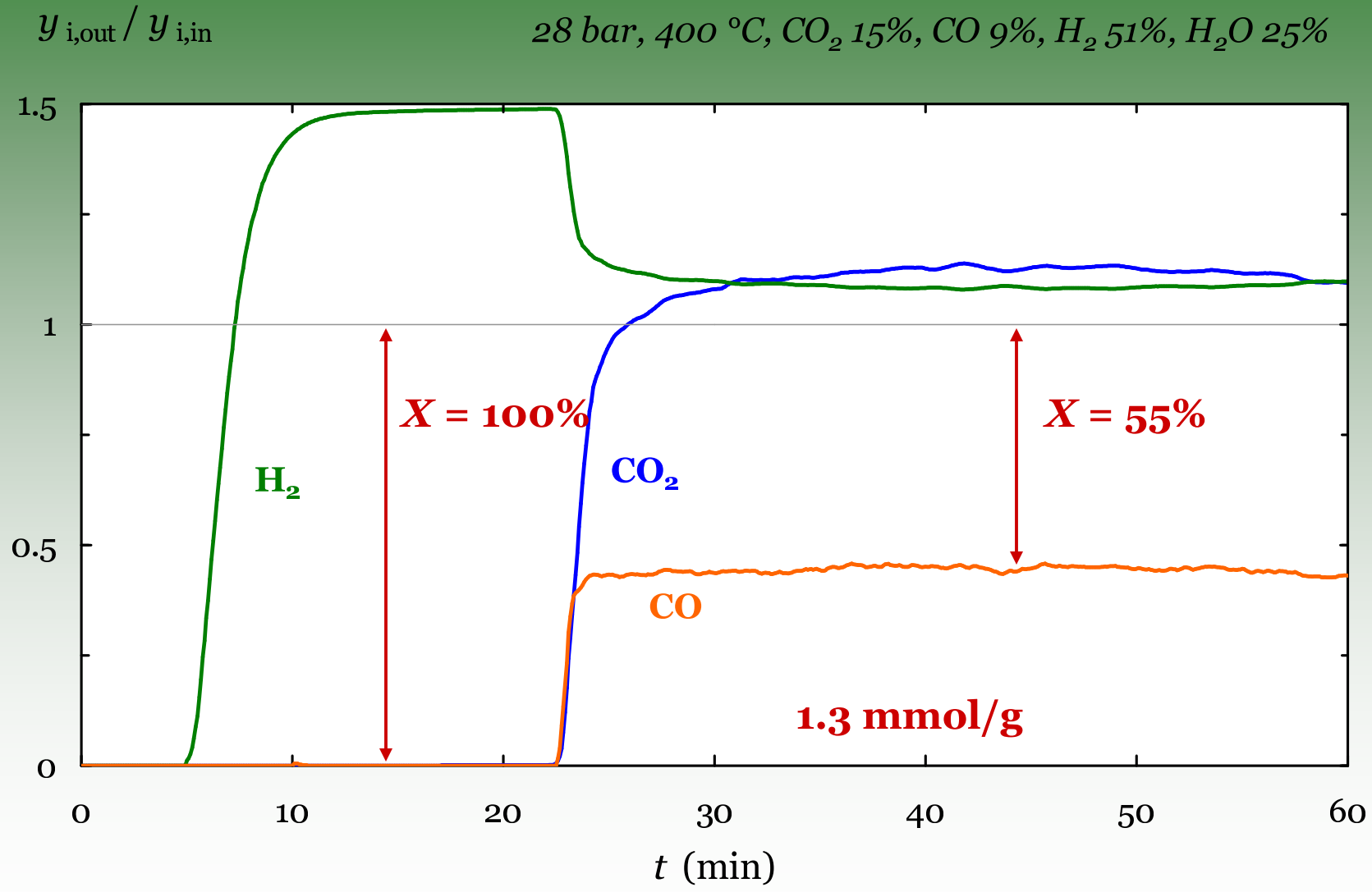
Breakthrough Testing (CO_2)



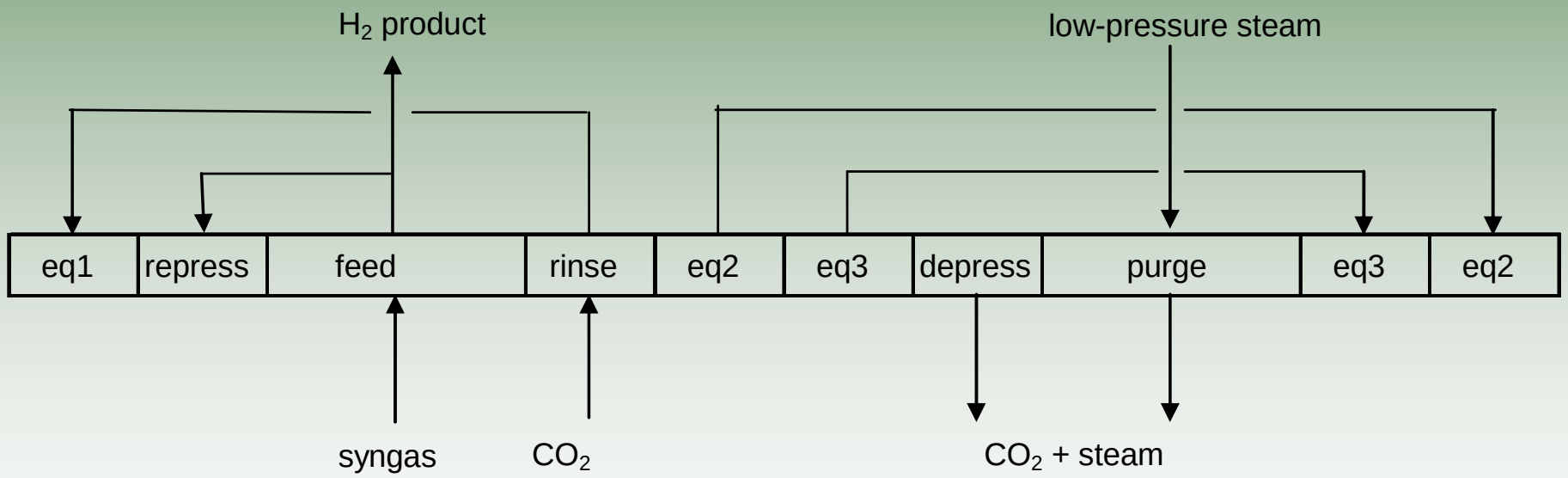
Adsorption Wave Velocity



Breakthrough Tests (syngas)



Pressure Swing Cycle



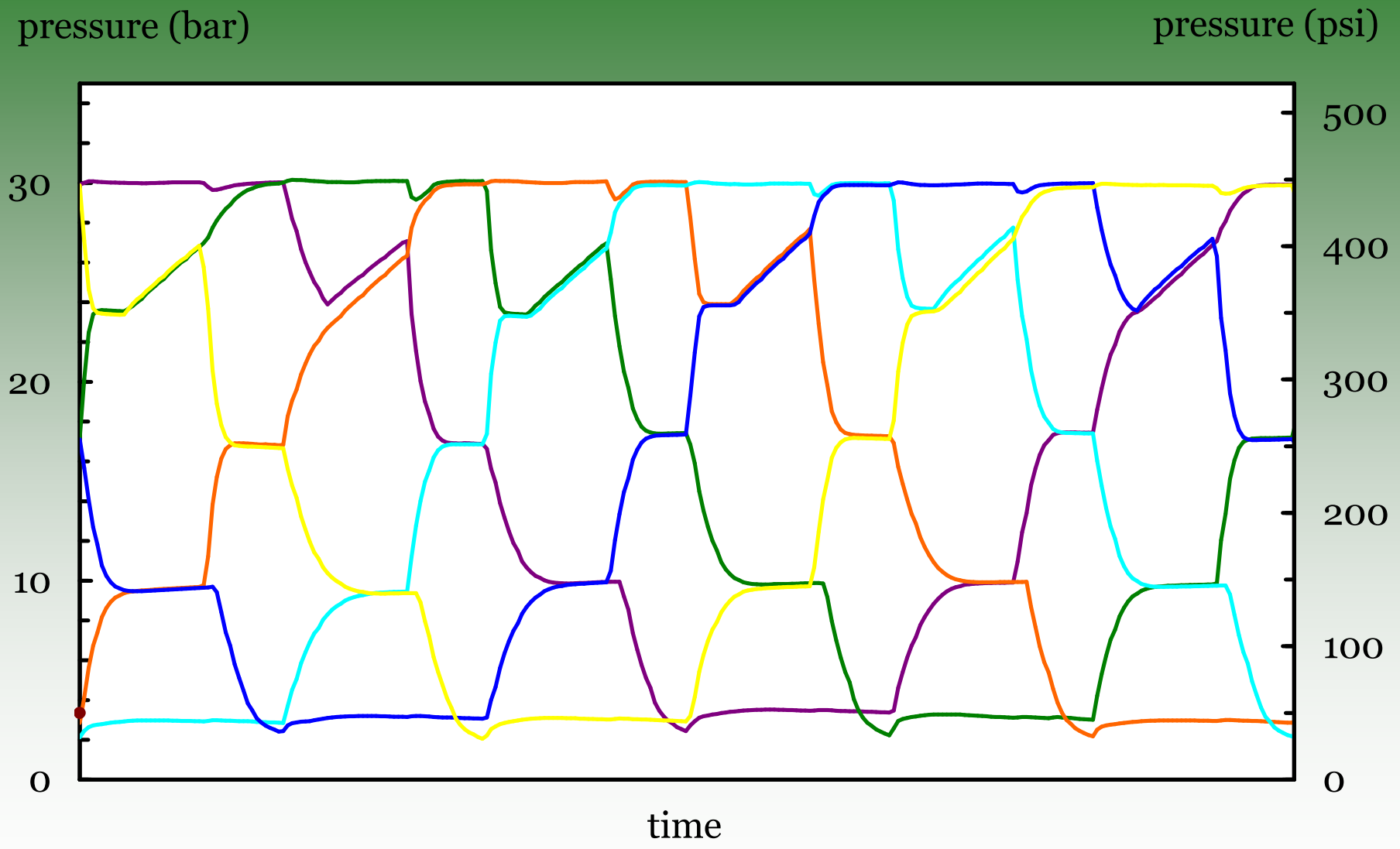
Experimental Conditions

Feed pressure	30 bar (435 psi)
Reactor temperature	400 °C (752 °F)
Purge flow / carbon feed flow	2 mol/mol

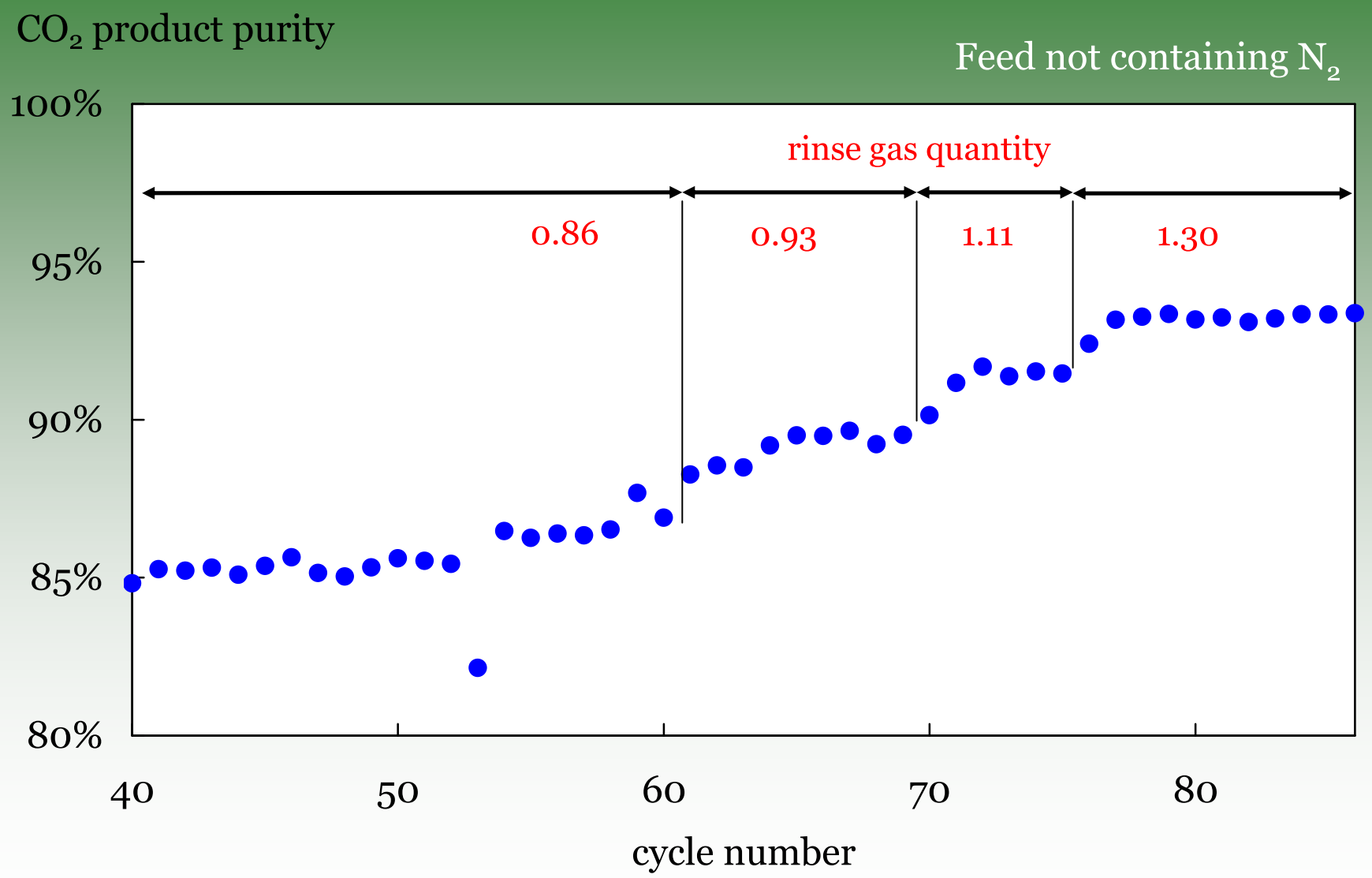
Feed composition:

H_2	CO_2	CO	N_2	H_2O	
38	13	6.4	43	12	%

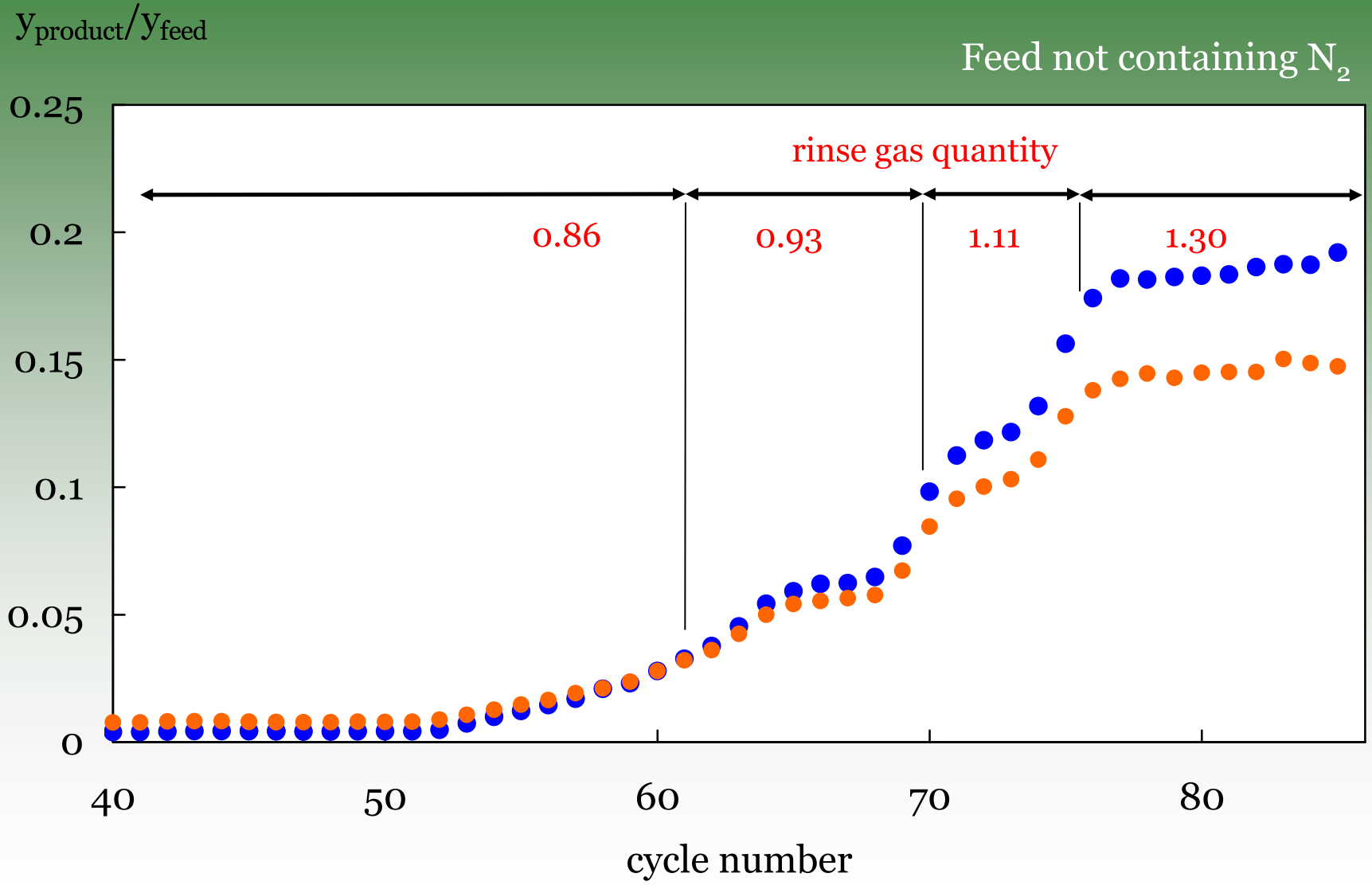
Reactor Pressures



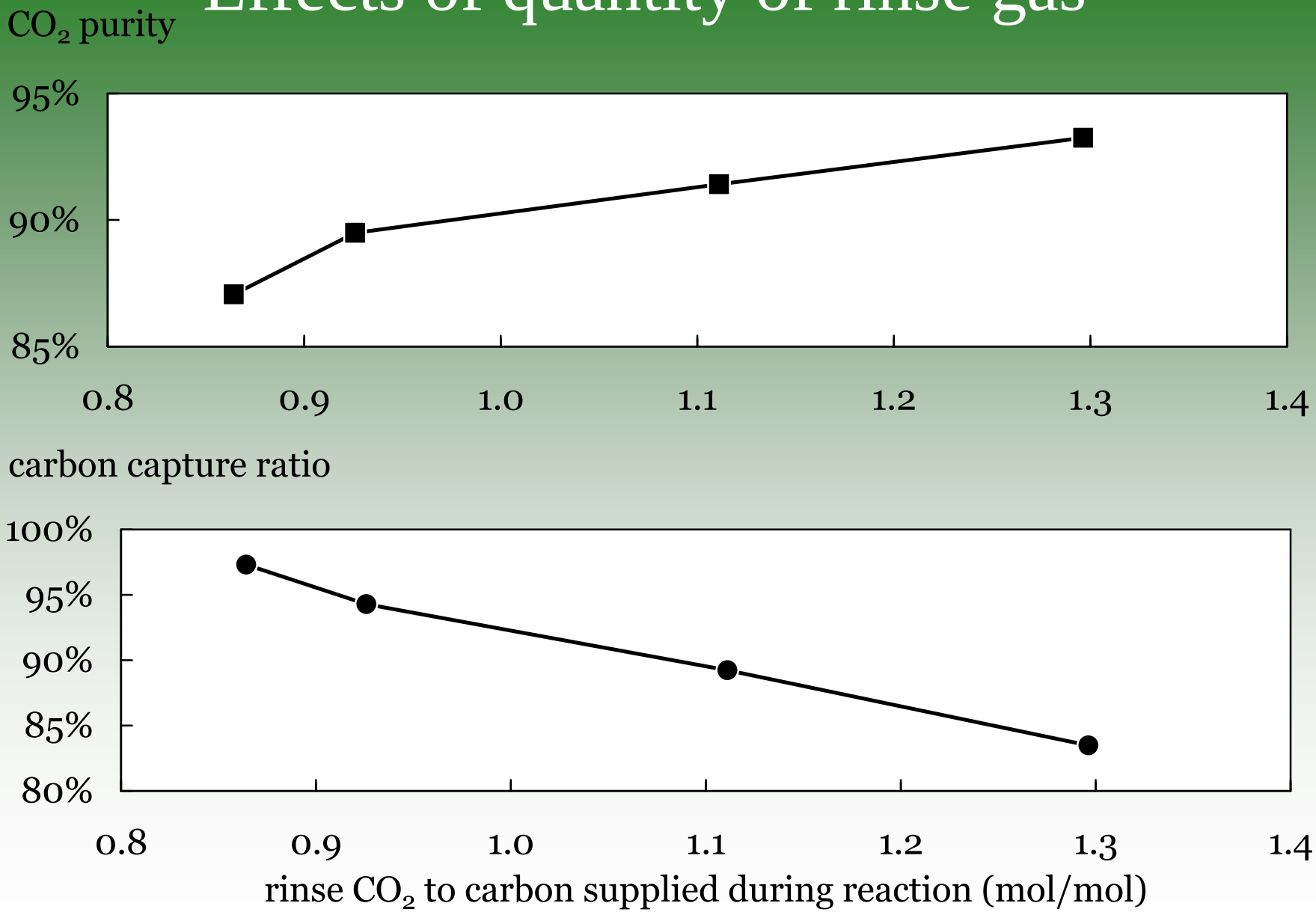
Rinsing Effectiveness



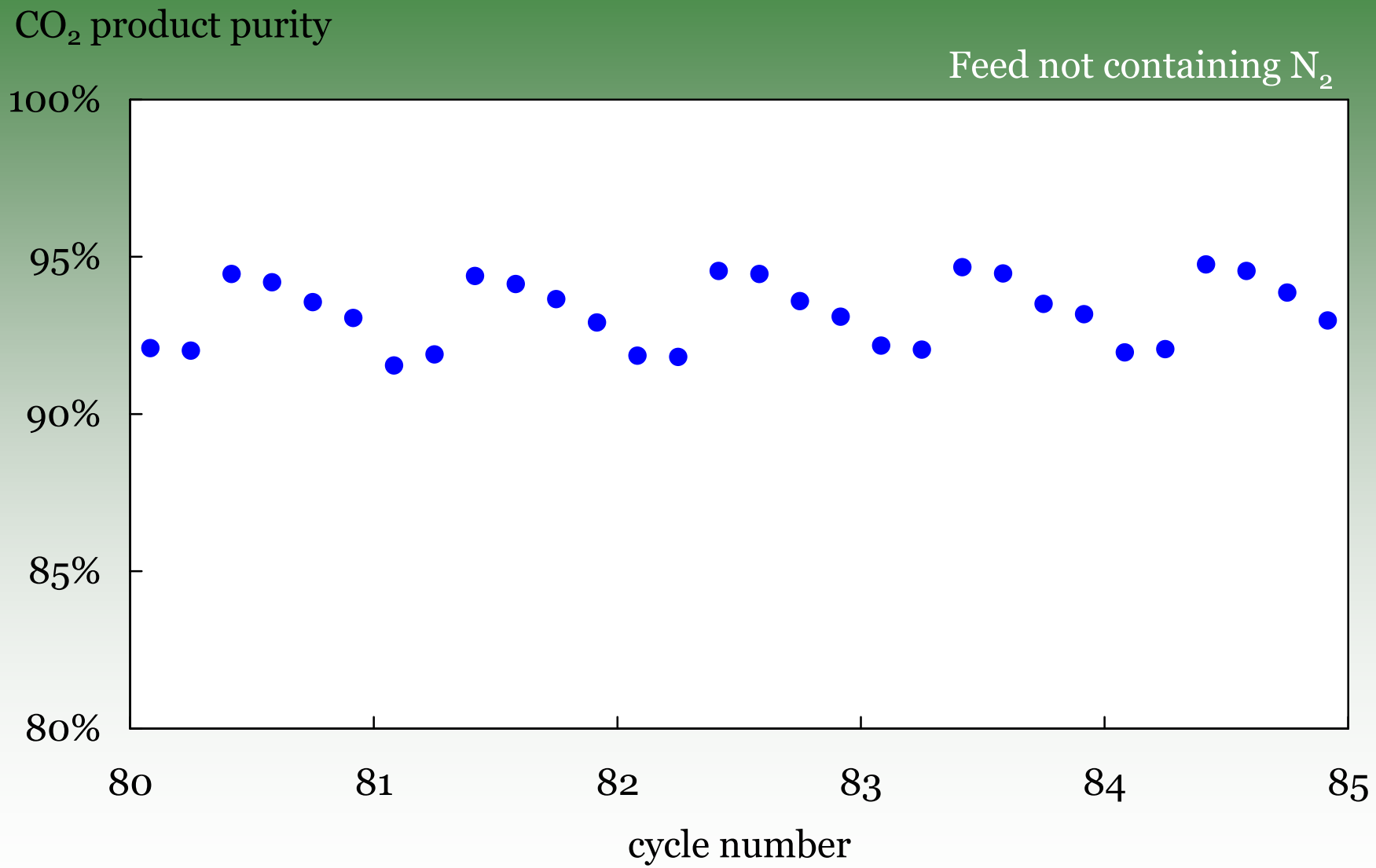
Impurities in H_2 product



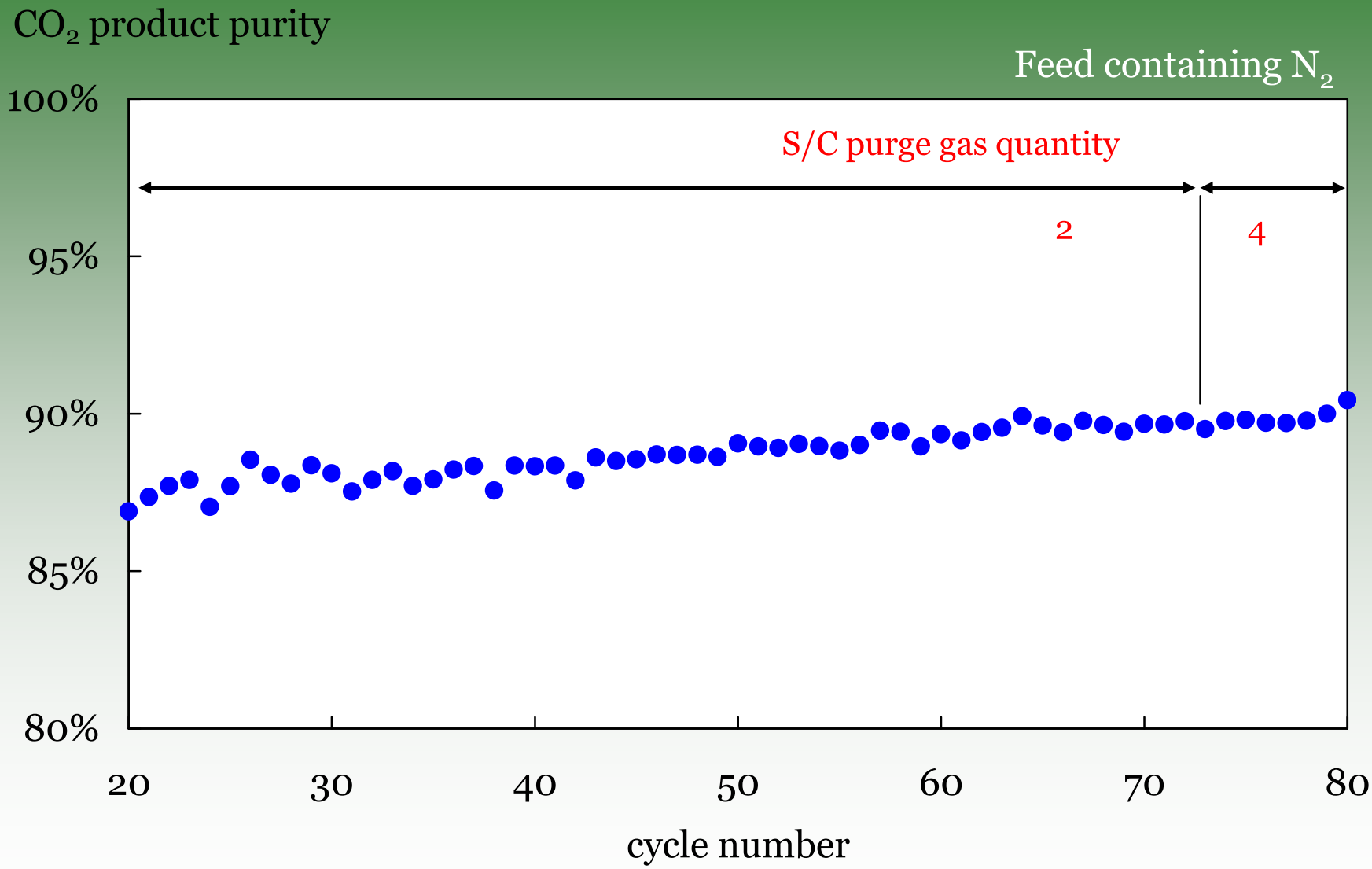
Effects of quantity of rinse gas



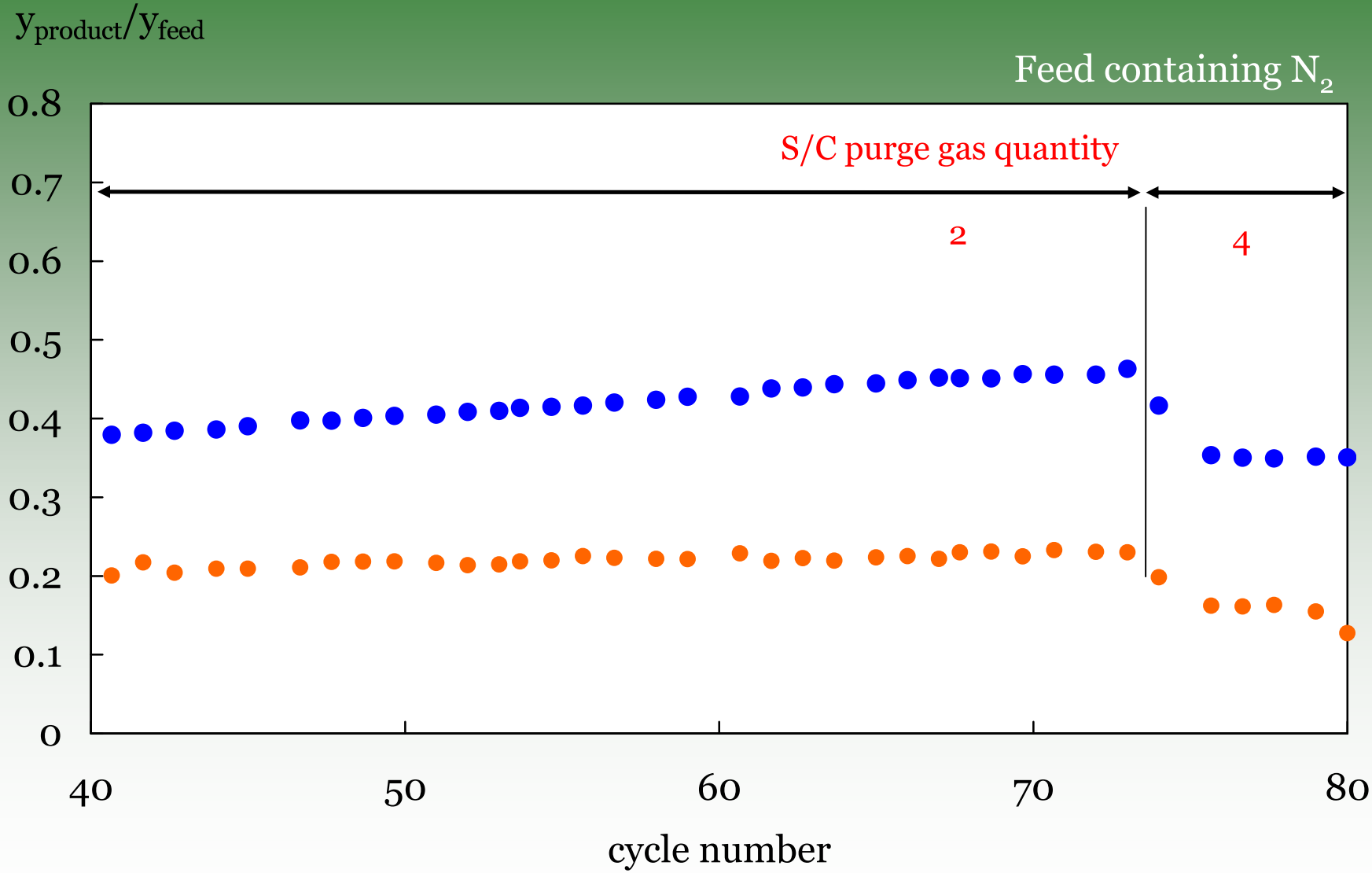
Differences between reactors



CO_2 product purity, purge flow



Impurities in H_2 product, purge flow

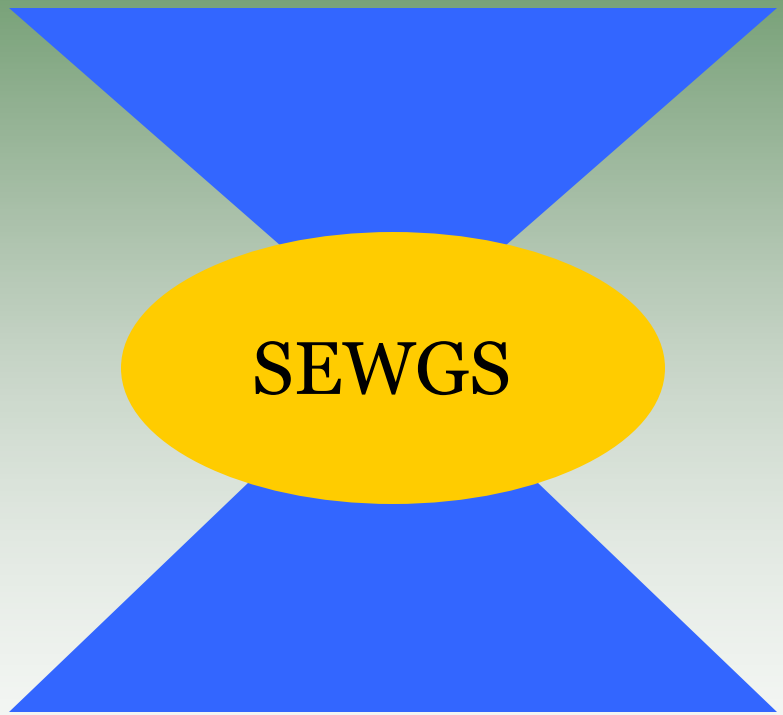


Recap

- Breakthrough capacity 1.4 mmol/g, fast kinetics
- Proof-of-principle SEWGS, 500 cycles
- Carbon recovery 90% and CO_2 purity 90%
- Performance better for O_2-blown ATR than air-blown ATR
- Optimisation of feed, rinse and purge flows

Outlook

NGCC IGCC H_2 production



reactor sorbent process

More Info at www.cachetco2.eu