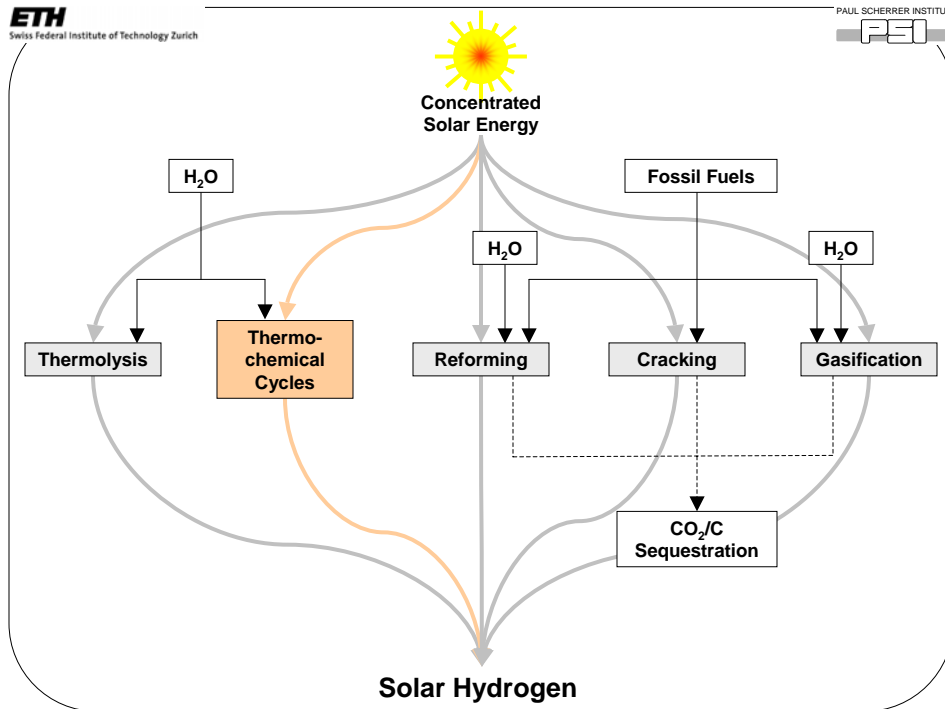
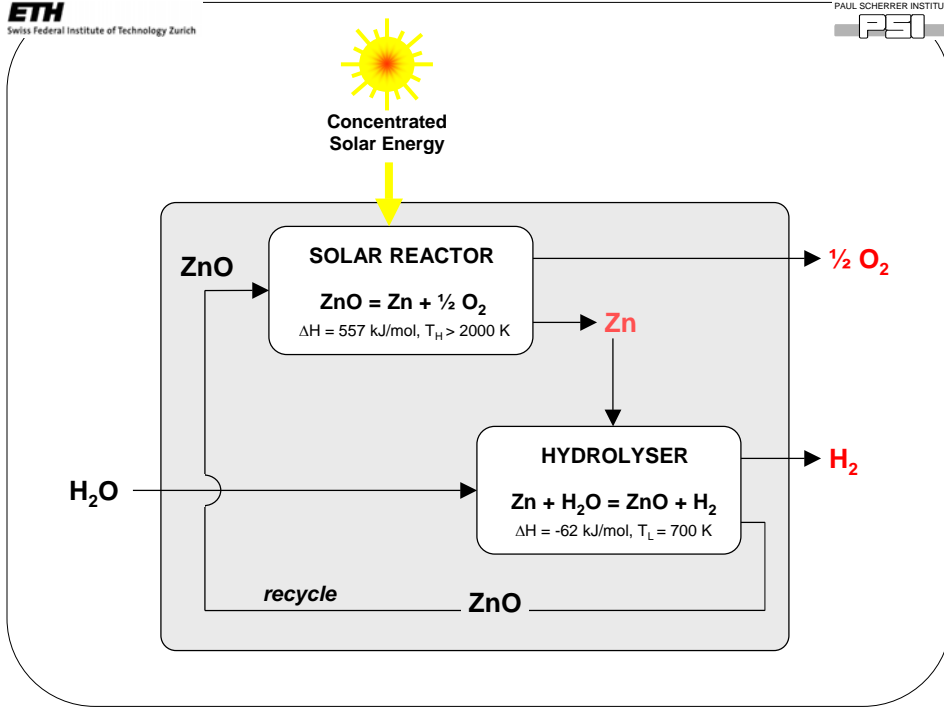
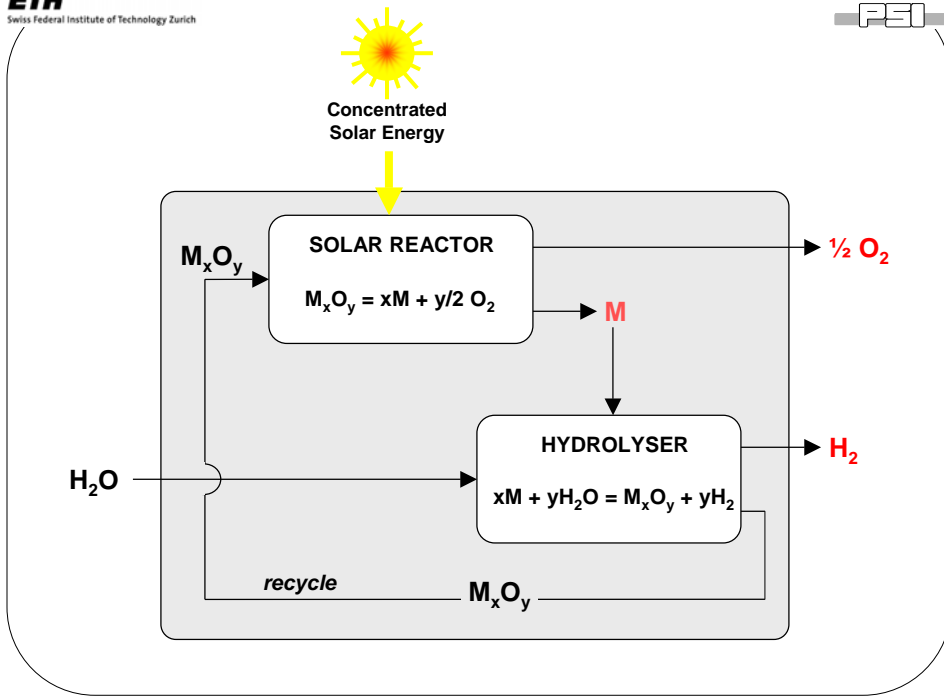


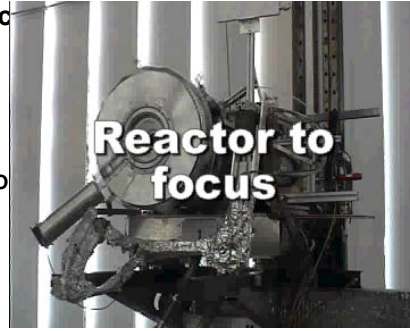
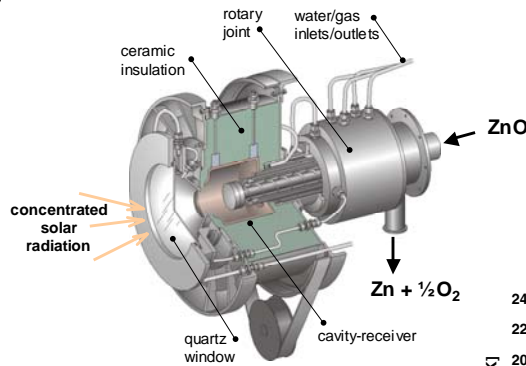
Project MAGHREB-EUROPE

Solar Thermochemical Production of H₂

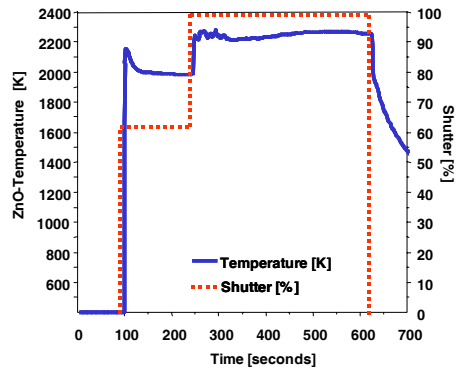
Aldo Steinfeld



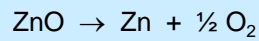




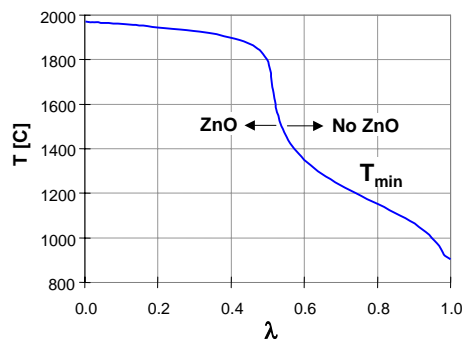
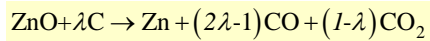
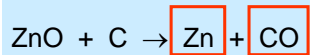
- $T_{reactor} = 2000 \text{ K}$
- $Q_{solar} = 5 \text{ kW}$
- $C_{peak} = 4000 \text{ suns}$
- $m_{ZnO} = 11 \text{ g/min}$
- Zn yield = 61%



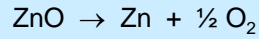
Thermal Dissociation



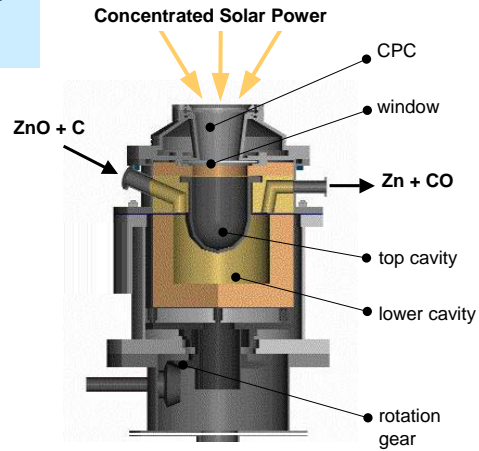
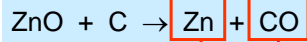
Carbothermic (coke, biomass, ...)



Thermal Dissociation



Carbothermic (coke, biomass, ...)



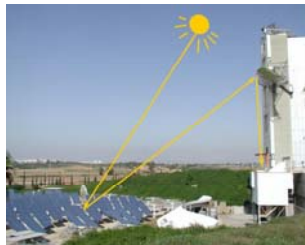
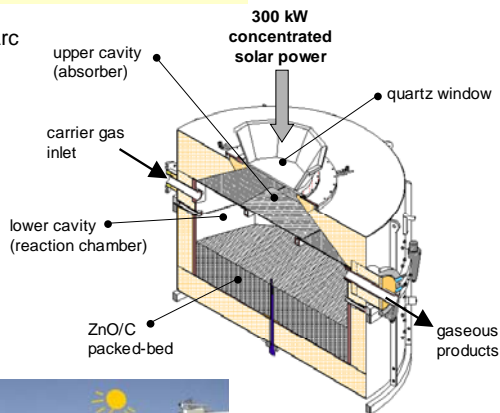
- Osinga et al., *J. Solar Energy Engineering* **126**, 633-637, 2004.
- Osinga et al., *Ind. Eng. Chem. Res.* **43**, 7981-7988, 2004.

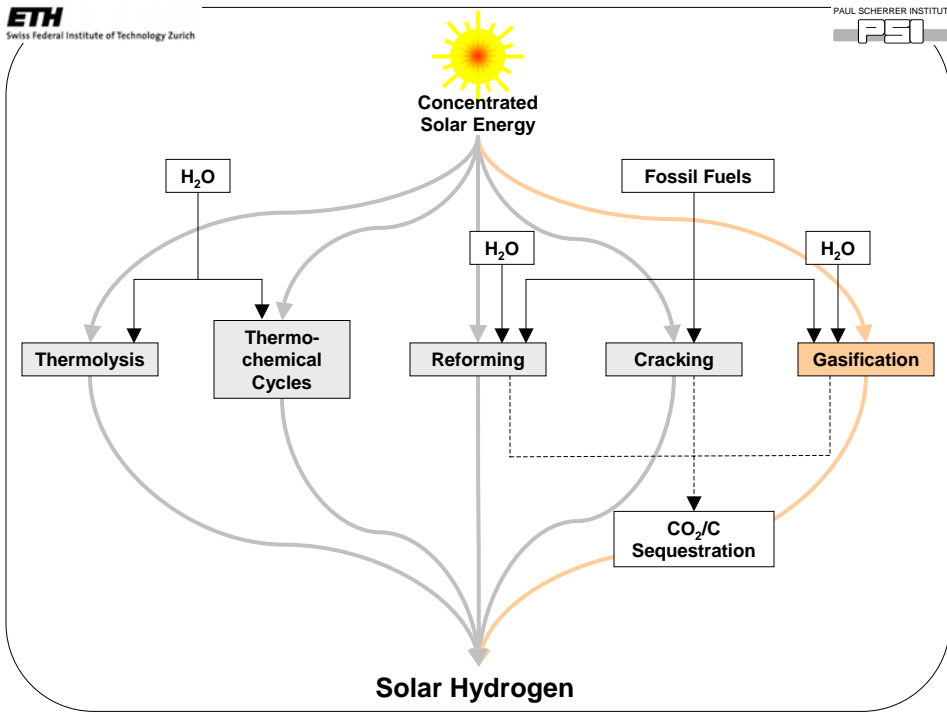
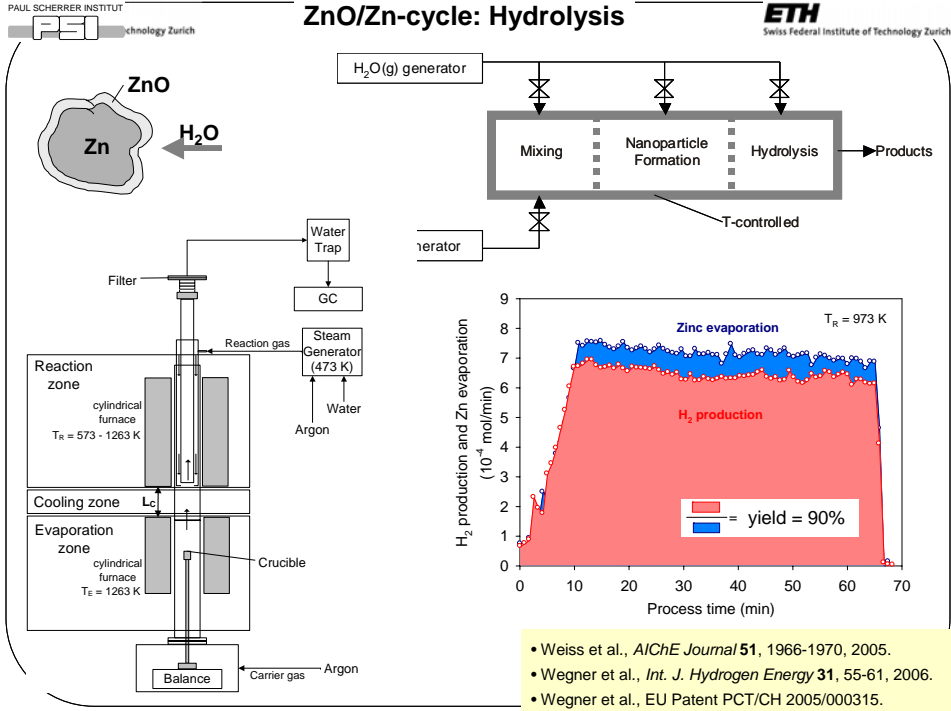
EU-SOLZINC: 300 kW Solar Reactor

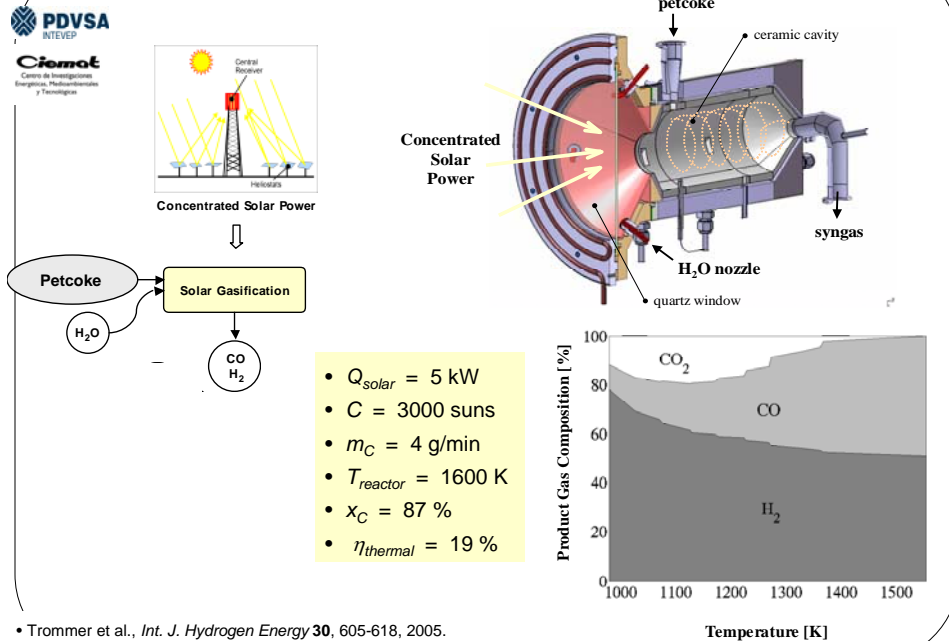
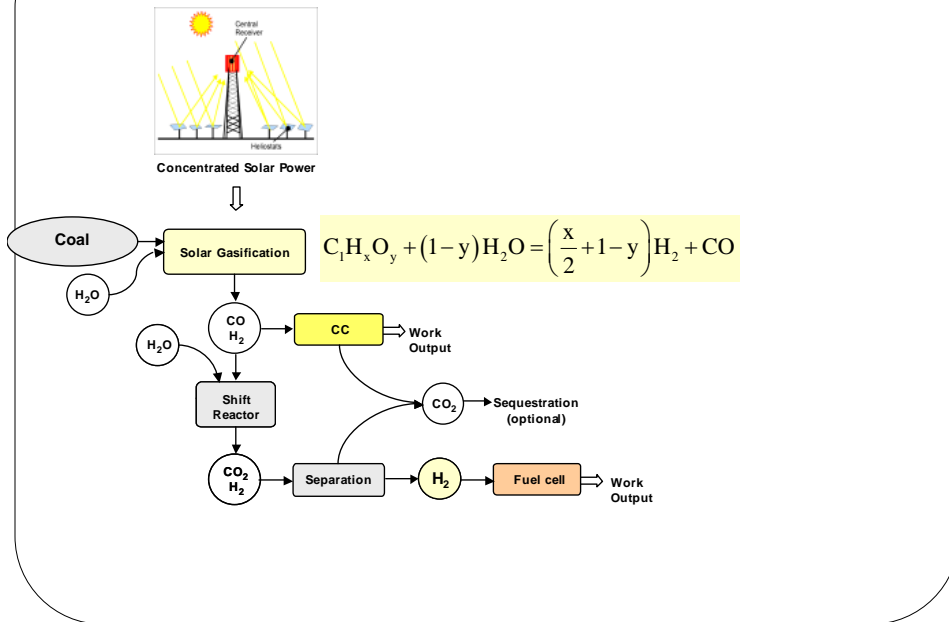
- Partners: PSI, ETH, WIS, CNRS, ScanArc

- Solar power input, $Q_{\text{solar}} = 300 \text{ kW}$
- Solar concentration, $C = 1500 \text{ suns}$
- Reactor temperature, $T_{\text{reactor}} = 1500 \text{ K}$
- Zn production rate = 45 kg/h
- Zn purity = 95%
- Thermal efficiency:

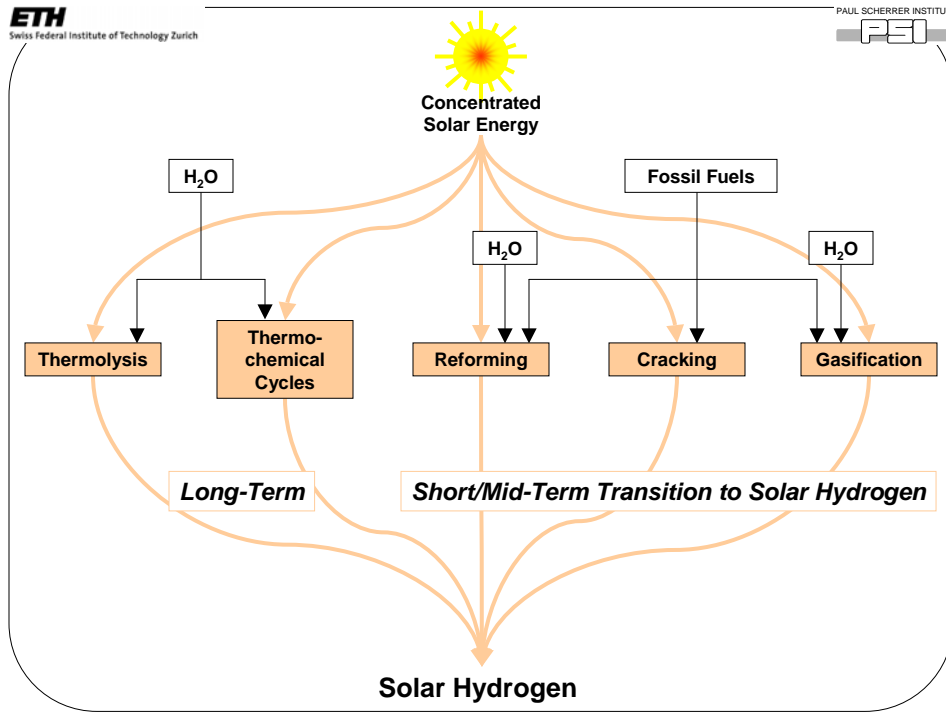
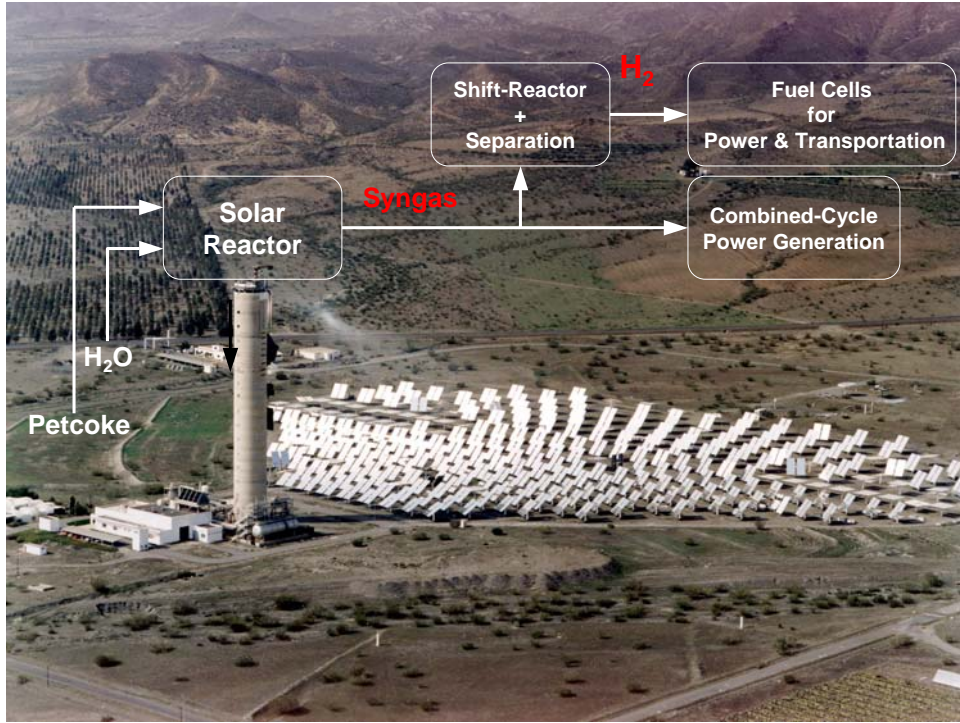
$$\eta_{\text{thermal}} = \frac{\Delta H}{Q_{\text{solar}} + HV_C} = 30\%$$







• Trommer et al., *Int. J. Hydrogen Energy* **30**, 605-618, 2005.
• v. Zedwitz et al., *Ind. Eng. Chem. Res.* **44**, 3852-3861, 2005.



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