



CO₂ capture and conversion to chemicals

Thai Q. Bui (PhD Student)

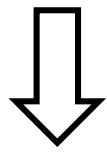
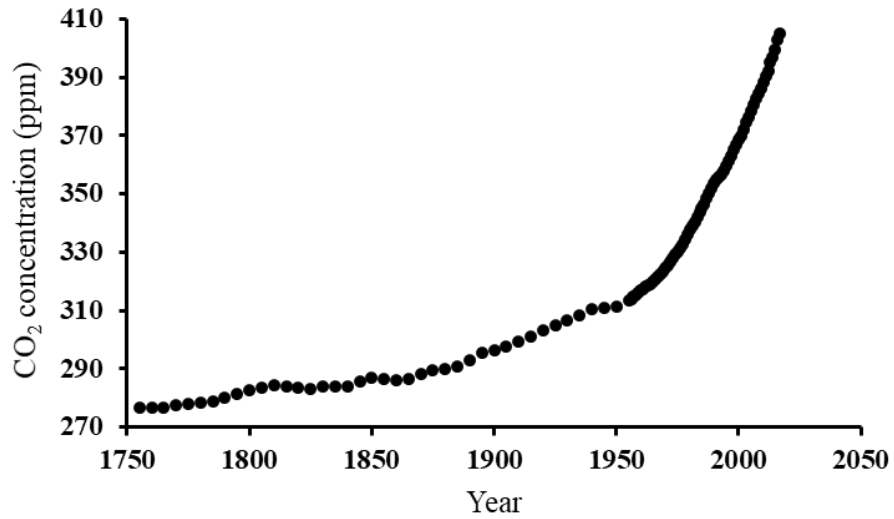
Jyri-Pekka Mikkola's Group

Department of Chemistry

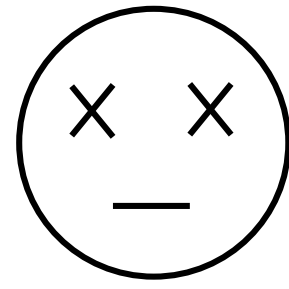
Umeå University, Sweden

October 16th, 2018

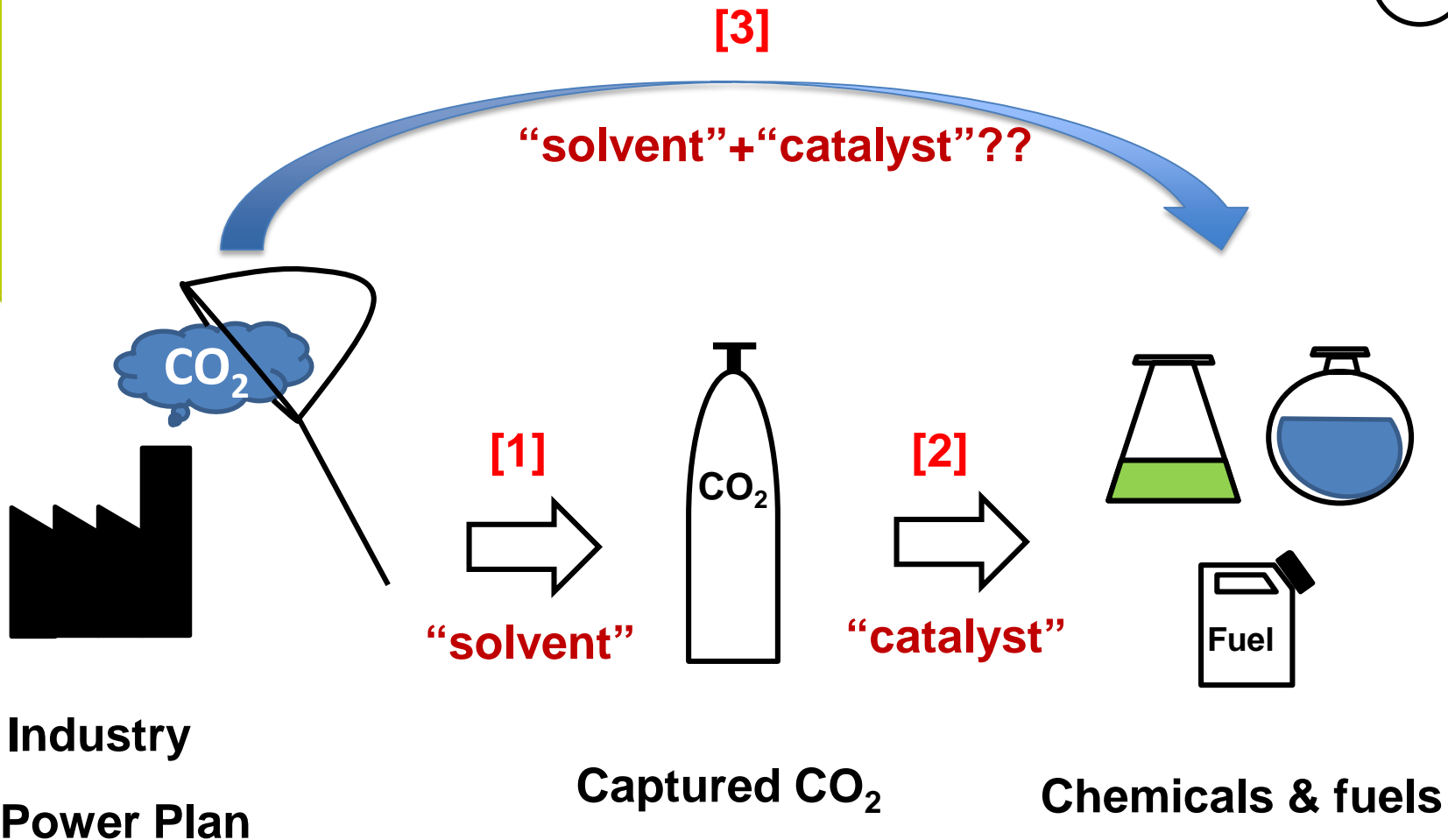




Earth



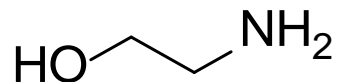
Human



- [1] CO₂ capture
- [2] CO₂ conversion
- [3] "One pot" CO₂ capture and conversion

• Example #1: CO₂ capture

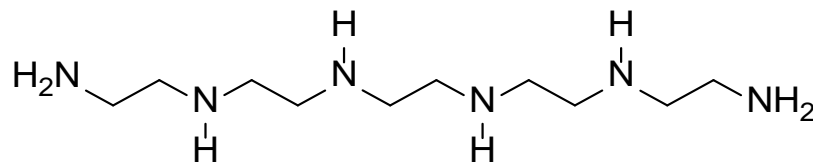
☐ aq. Monoethanolamine (Industrial solvent)



$pK_a = 9.5$ (in water)

- Melting point: 10 °C
- Boiling point: 170 °C
- Vapor pressure: 0.2 mm Hg (20 °C)

☐ aq. Pentaethylenhexamine (New solvent)

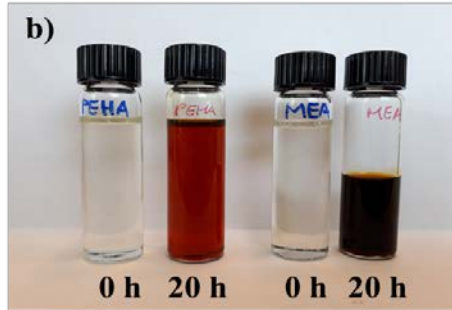


$pK_a = 9.7, 11$ (in water)

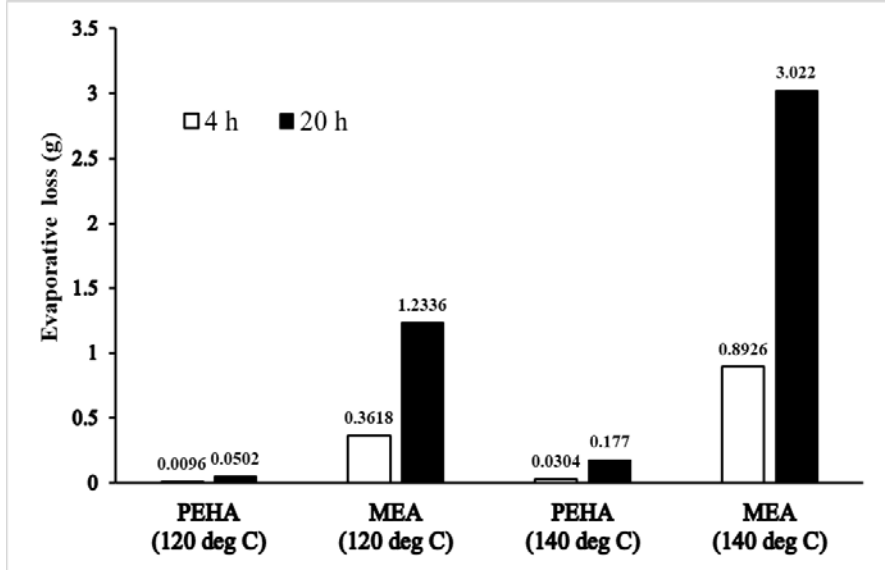
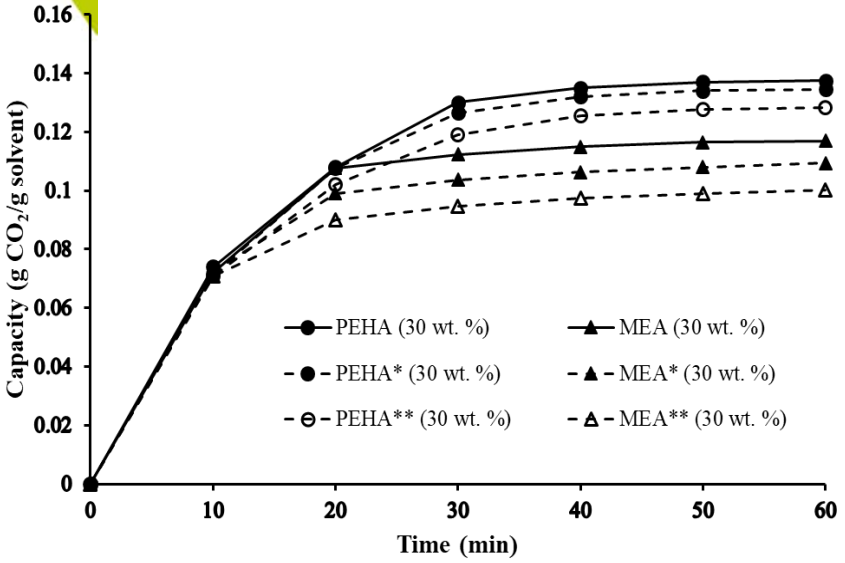
- Melting point: -35 °C
- Boiling point: 380 °C
- Vapor pressure: Negligible



120 °C



140 °C

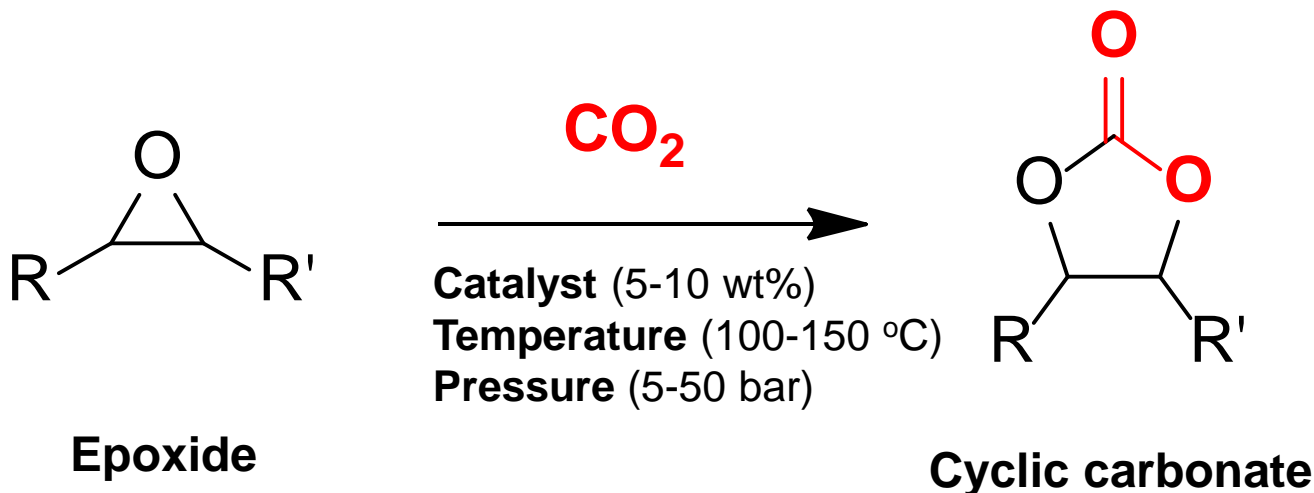


(*) after heating at 120 °C for 20 hours
 (**) after heating at 140 °C for 20 hours

- Higher capacity
- Less evaporative loss
- More stable ...

• **Example #2: CO₂ conversion**

N-rich biowaste (chitosan ...) $\xrightarrow{\text{treatment}}$ **Carbocatalyst**



- Solvent free
- Mild conditions
- Excellent catalytic activity (yields up to 99%)
- Cheap catalyst ...

Switchable Aqueous Pentaethylenehexamine System for CO₂ Capture: An Alternative Technology with Industrial Potential

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Renewable N-doped active carbons as efficient catalysts for direct synthesis of cyclic carbonates from epoxides and CO₂



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BIO4ENERGY



Vetenskapsrådet



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Johan Gadolin
Process Chemistry Centre

Välkommen till Kempestiftelserna

Stiftelserna J.C. Kempe och Seth M Kempes Minne



Syfte:



Att i fråga om Västernorrlands, Västerbottens och Norrbottens län främja vetenskaplig forskning samt vetenskaplig och annan undervisning och utbildning, så och religiösa, välgörande, sociala, konstnärliga och andra därmed jämförliga kulturella ändamål, även som att främja nämnda läns jordbruksnäring.



THANK YOU