NTNU
Norway

Department of Chemical Engineering

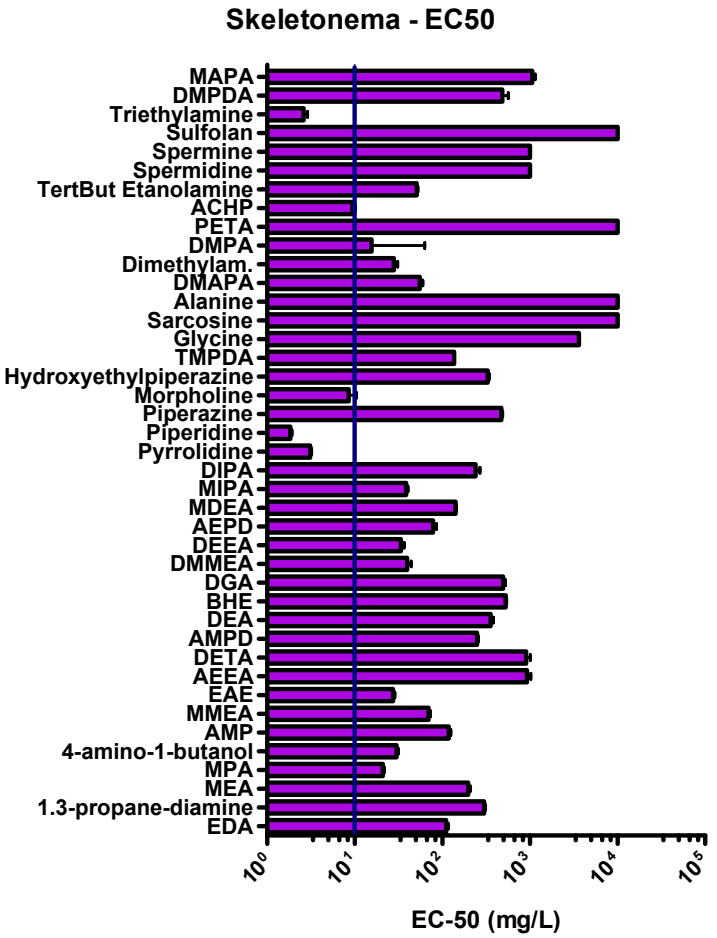
Remarks on post combustion CO_2 capture systems

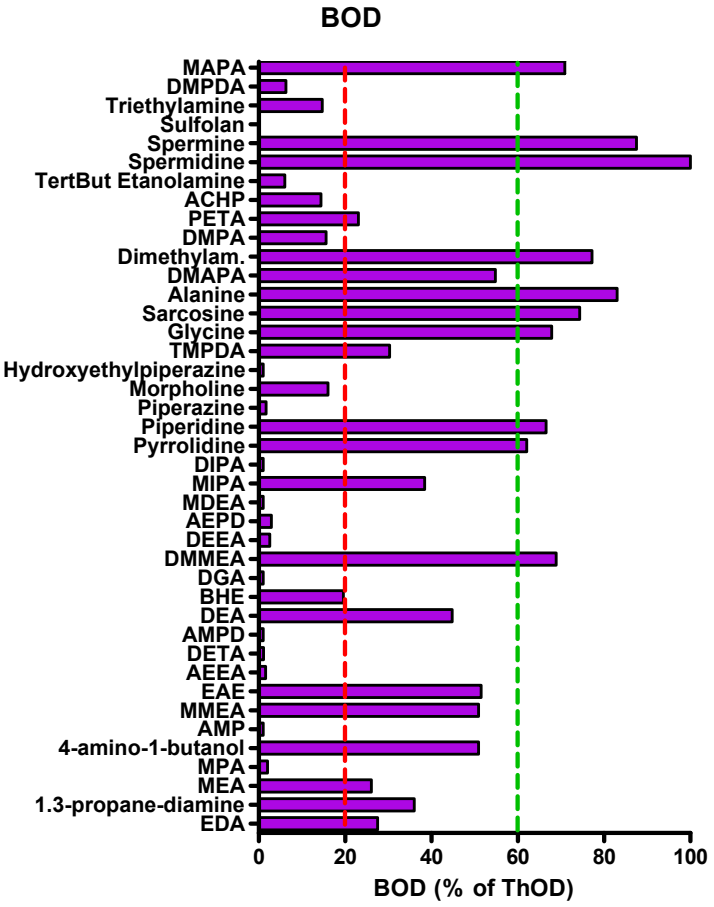
1) Environmental concerns Categorization of chemicals OSPAR Convention

Category	*Criteria – Ecotoxicity tests*	*Actions*
Black	•Priority list (Stortingsmelding Nr. 25) •OSPAR List of Chemicals for Priority Action •Both low biodegradability and high bioaccumulation (BOD28 < 20 %, and Log P_{OW} ≥ 5) •Low biodegradability and toxic (BOD28 < 20 %, and EC50 or LC50 ≤ 10 mg/L) •Compounds expected to be carcinogenic/mutagenic or harmful to reproduction	**Not discharged**
Red	•Inorganic chemicals with high toxicity (EC50 or LC50 ≤ 1 mg/L) •Organic chemicals with low biodegradability (BOD28 < 20 %) •Organic chemicals or mixtures which meet 2 of the 3 following criteria: Biodegradability < 60 %, bioaccumulation potential (Log P_{OW} ≥ 5), or toxicity of EC50 or LC50 ≤ 10 mg/L	**Phased out or replaced**
Yellow	•Include compounds which based on their characteristics are not defined as RED or BLACK, and •NOT included in the PLONOR list	**Accepted**
Green	•Chemicals expected to have NO environmental effects •PLONOR list	**Testing not required**

Example results

Ecotoxicity and biodegradability for 41 solvents.





NTNU Norway
Department of Chemical Engineering

Phase change absorption systems

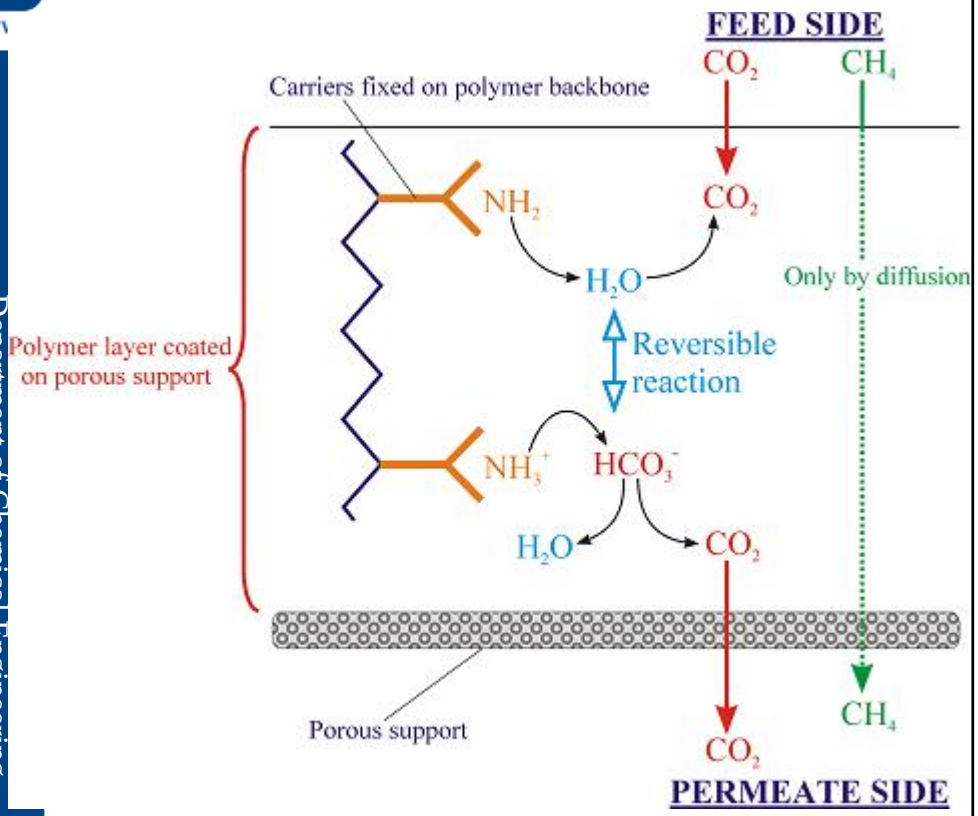
Precipitation:

- Alstom Chilled Ammonia
- Precipitating amino acid systems

Two liquid phases:

- IFP process

Facilitated Transport by a "fixed-site-carrier" (FSC) membrane



Example gas mix: CO_2 – N_2

Example existing membrane

Cellulose Acetate (CA)

CO_2 flux: 0.15 m^3(STP)/(m^2 h bar)

Selectivity CO_2/N_2 : ~30

Comment:

The simple, polymeric membranes will never be an alternative for CO_2-N_2 separation in large volume gas streams such as flue gas

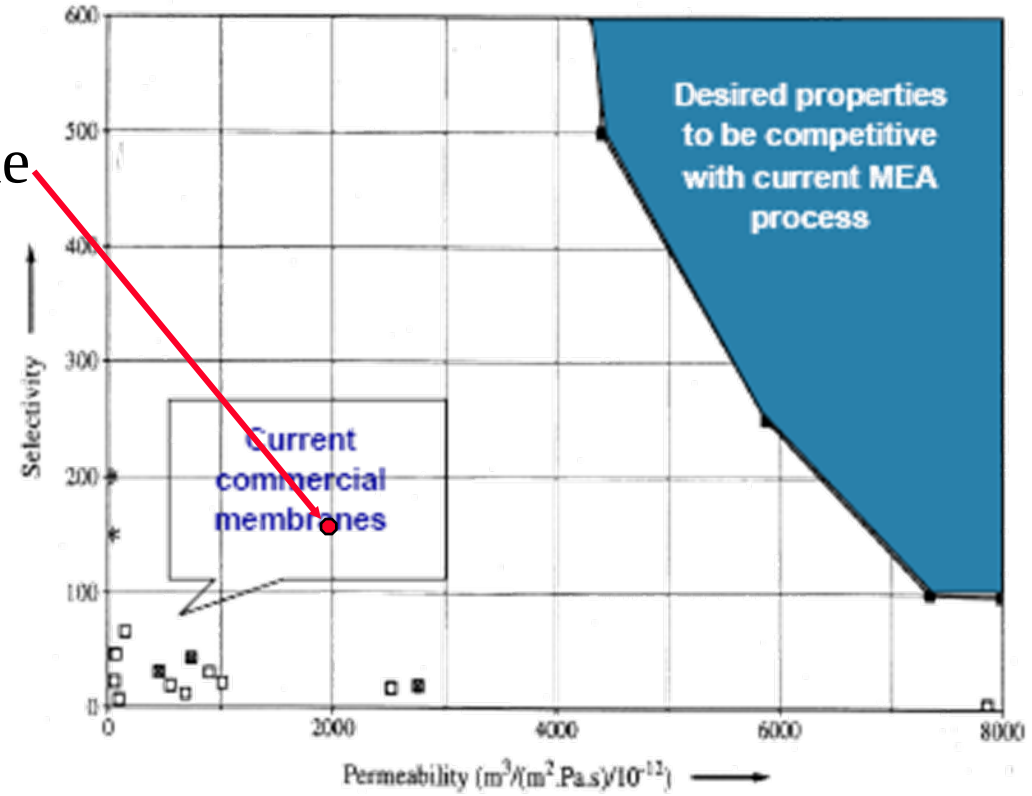
⇐The New FSC-membrane may be attractive for integrated solutions.

CO_2 flux → 0.70 m^3(STP)/(m^2 h bar)

Selectivity CO_2/N_2 : > 150

PCT: Hägg, MB, Kim TJ, Li,B.: WO2005/089907

FSC membrane



Other options:
Dual action, liquid filled membranes