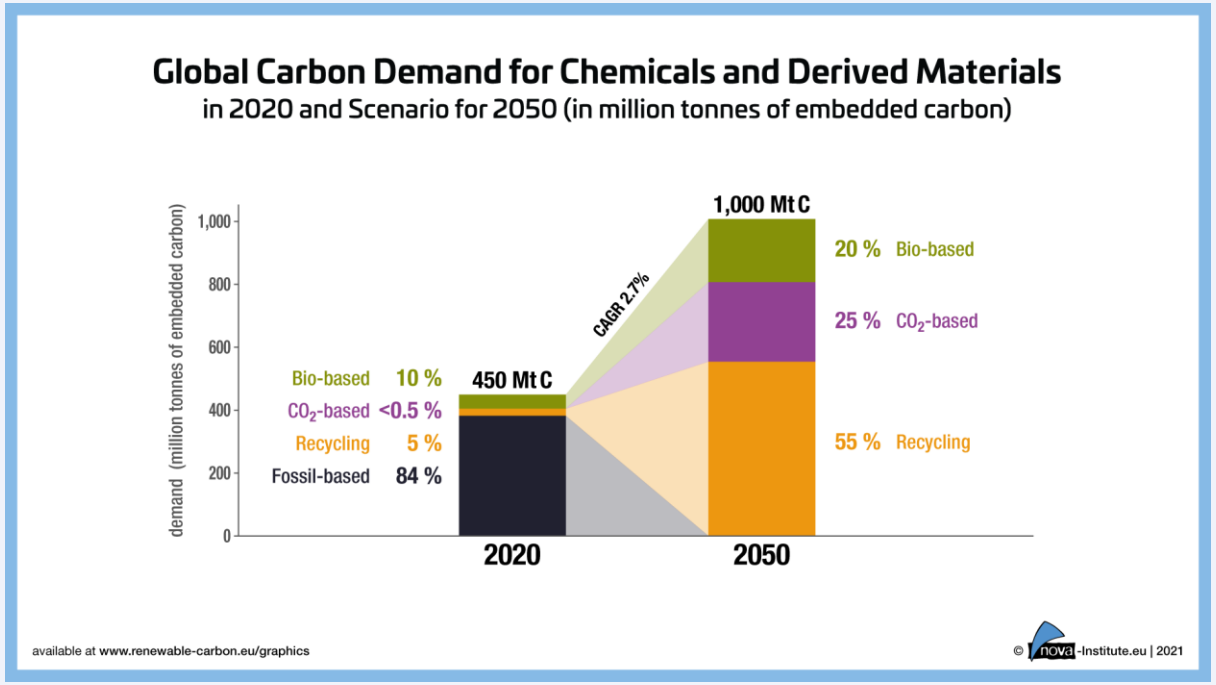
CCU for coatings & adhesives

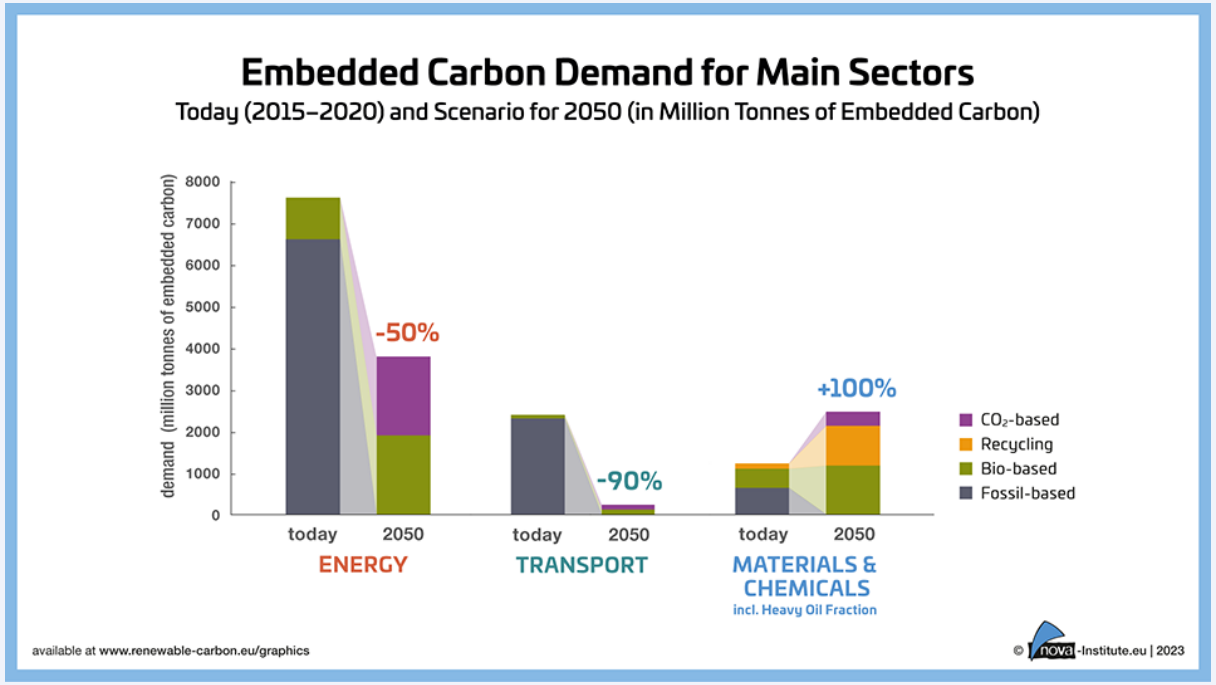
All solutions are needed, but all solutions are not equal!

Dr. Monalisa Goswami | Coatings Innovatiedag 2025

The Holy Grail for renewable carbon feedstock



Just recycling & biobased will not fulfil the demand for Carbon feedstock for our 2050 climate goals



While the energy sector can decarbonise extensively, materials is inherently a different story

CO_2 based products are today already in the market

cardyon™

SkyNano

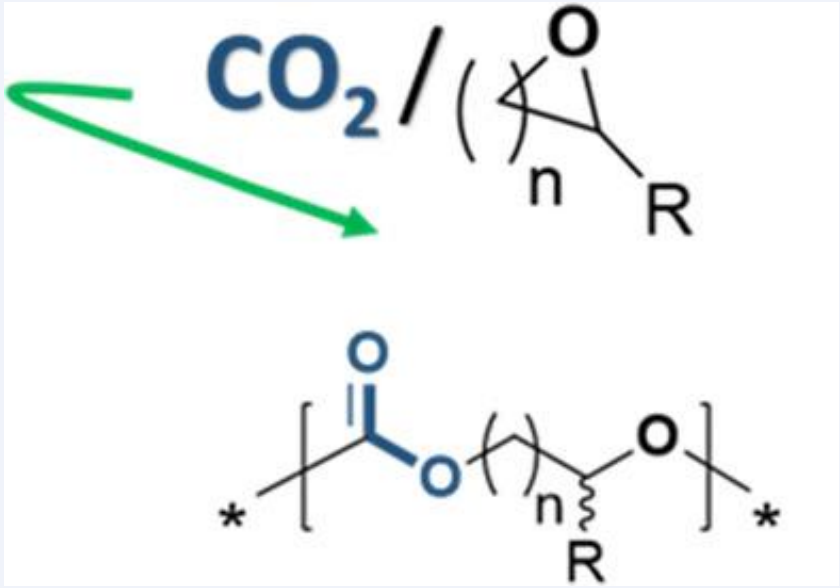
ECONIC

TURNING CO_2 INTO ENDLESS POTENTIAL

NOVOMER

CleanO2

Successful concepts employ CO_2 as a building block: max 20-30% CO2

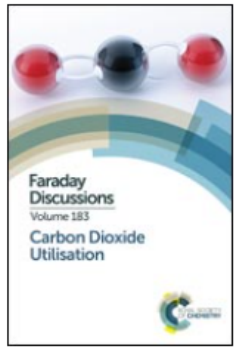


A WALK IN THE PARK COMPARED TO CO_2 ACTIVATION

The Twelve Principles of CO_2 CHEMISTRY †

Martyn Poliakoff,*[a] Walter Leitner*[bc] and Emilia S. Streng[ab]

Volume 183, 2015



From the journal:
Faraday Discussions

C	Catalysis is crucial
O	Origin of the CO_2?
2	Tomorrow's world may be different
C	Cleaner than existing process?
H	High volume or high value products?
E	E-factor must be low
M	Maximize integration
I	Innovative process technology
S	Sustainability is essential
T	Thermodynamics cannot be beaten
R	Renewable (& reasonable) energy input
Y	Your enthusiasm is not enough

CO_2 utilisation technologies today focus on C1/ C2 commodity molecules

Pathway	🧪 TRL	🏭 Commercial Viability	📈 Scalability Potential
Methanol from CO_2 + H_2	8–9	High (CRI, Methanex)	High
Formic acid (electrochemical)	5–6	Low (lab-scale mostly)	Medium
Dimethyl Ether (DME)	7–8	Growing (Oberon)	Medium–High
Carbonate mineralization	8–9	Growing (CarbonCure)	Very High
Polyurethanes from CO_2	7–8	Active (Covestro, FENC etc)	Medium
Bioethanol via CO_2 fermentation	8	LanzaTech, others	High
Graphene from CO_2	4–6	Early pilots	Medium

CO_2 based Methanol is a Game Changer

- ***Entire chemical value-chains are based on Methanol***
- ***Methanol is an excellent building block for both fuels & chemicals***

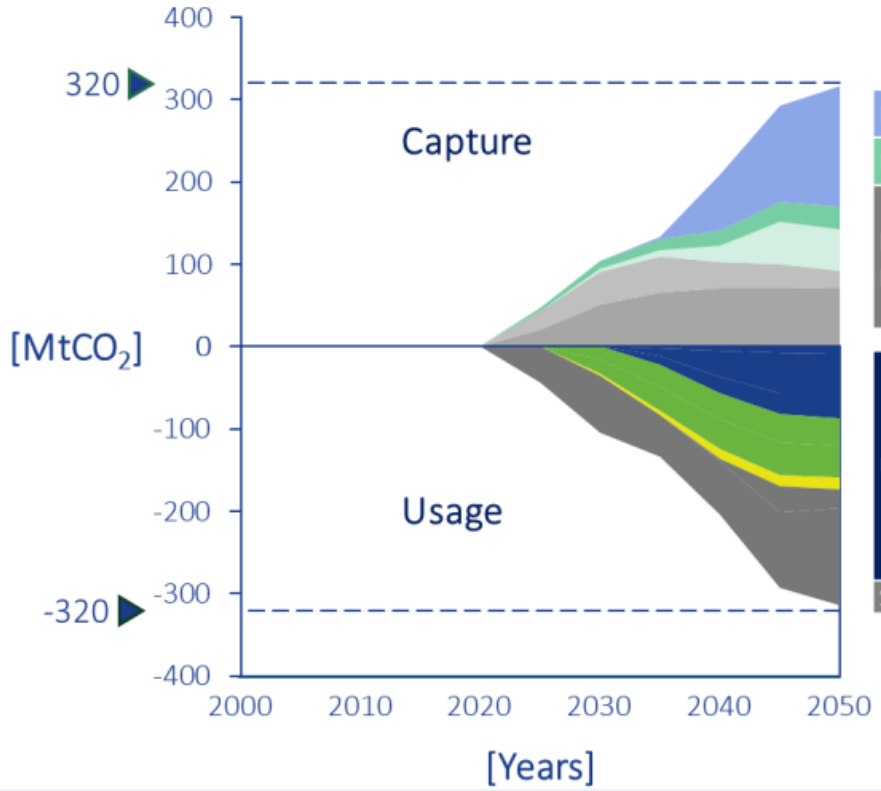
Ways to make Methanol from CO_2

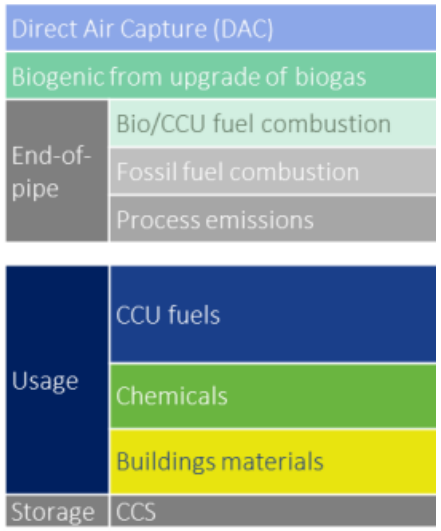
Method	Inputs	Pros	Cons
Thermochemical Hydrogenation	$CO_2 + H_2$	Industrial-scale ready	Needs green H_2
RWGS + CO Hydrogenation	$CO_2 + H_2$	Flexible CO:H_2 ratio control	More complex
Electrochemical	$CO_2 + H_2O + e^-$	Renewable electricity use	Low efficiency/selectivity

$$


WHAT
ARE YOU
WAITING
FOR?

Costs & availability of captured CO_2 will drive the successful implementation & scalability



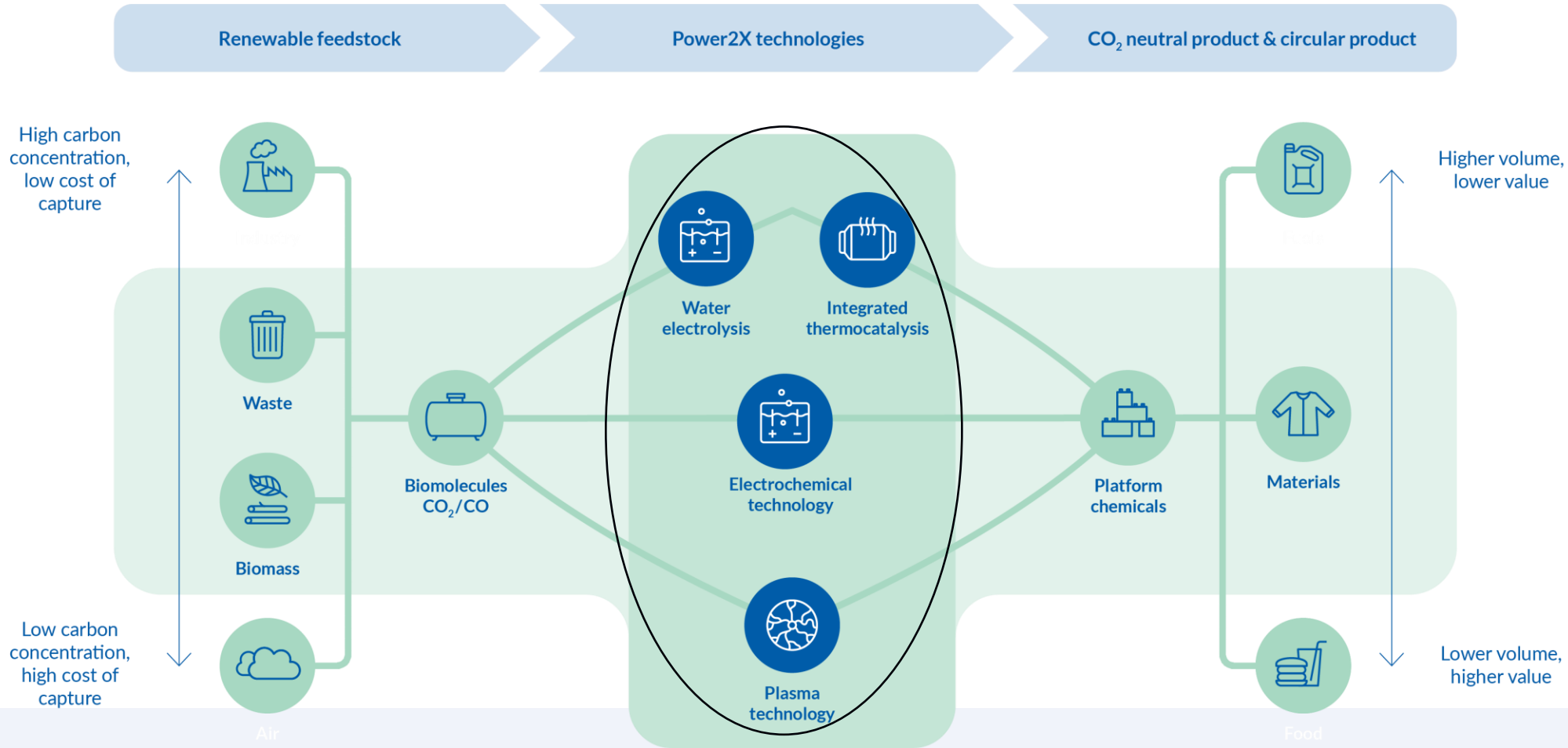


DAC remains energy intensive, biogenic CO2 seems to currently limited

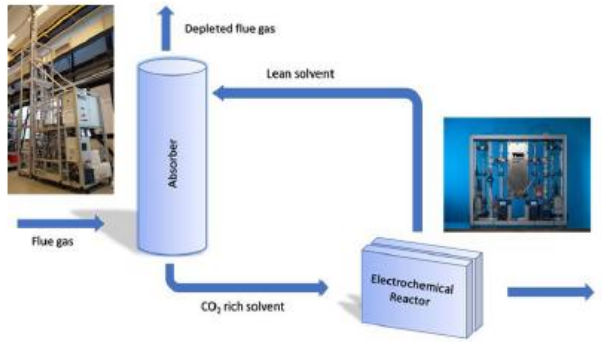
Today CCU Fuels are gaining quick traction due to policy measures (SAF mandate)

Source: CO_2 ValueEurope

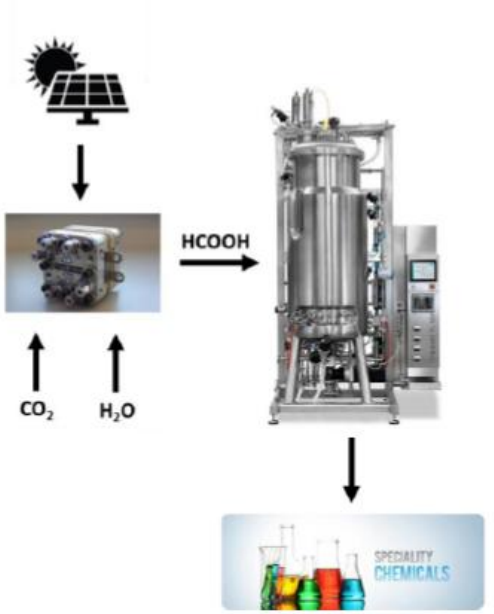
The roadmap to a carbon-neutral materials world



Disruptive electrochemical technologies are on track to be commercial by 2035



Capture-integrated CO2 conversion
to fuels and plastic intermediates



Fermentation integrated electrolysis
to high-value ingredients
and/or Feed & Food ingredients (proteins)

PERFORM pilot for electrochemical biobased chemicals production (1kg/ day scale)

Join TNO's market consultation on CCU for the CASE market

Q3-Q4 2025

Market consultation with 10 (max) selected companies

Selection of routes, challenges & road-mapping

Q1 2026

Call for participation to join an industrial shared research programme

Minimum 3 companies
2-3 years
All parties incld. TNO co-invest

Q2-Q3 2026

Development plan, technical annex, Participation agreement

Start of Shared Research Programme
Quarterly updates, meetings, closed collaboration

Get-in-touch with us!

We are currently evaluating the start of several Shared Research Programmes in the field of electrochemical conversion of CO_2 and of bio-based feedstocks

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