



Jio LIFE IS BEAUTIFUL

4th NEXT GEN

Chemicals & Petrochemicals Summit 2024



Future of Chemicals

by

Partha Maitra

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Net Zero olefins

Status	# 1 chemical + high emissions Legacy steam cracker
H-Cracker	H ₂ to fuel cracker heater Preheat + electrification
E-Cracker	Electrify steam cracking Impedance heating
N-Cracker	N reactor + cracker combo He-cool, pebble-bed N-reactor Cracking energy + electrification
RDR	Roto dynamic reactor Reverse of gas turbine Rotational to cracking energy
EDH	Ethane de-hydro, like PDH Need catalyst breakthrough



⇒ **Fountainhead for sustainable petrochemicals**

Durable polymers

Polymers	Engineering + performance
	Material of the future
Engineering	Substitute C-intensive metals
	High strength / weight ratio
	EV + aerospace
Performance	Beyond metal properties
	Max. durability + strength
	Wind turbine blades, C-FRP



⇒ **Sequester C in durable polymers**

Recyclable

Feed	End-of-life waste
Process	Mechanical or chemical
Mechanical	Property + application downgrade
Chemical	Pyrolysis/ De-poly/ Solv treating
Pyrolysis	Reuse as Cracker feed Super critical H ₂ O / olefinic gas
De-poly	Reuse as monomer; PS → S Catalytic / thermal / microbial
Solv. Treat	Glycolysis/ Methanolysis / Ionic liq. Polyester / PET



⇒ **C circularity**

Input	1G = Food based biomass 2G = Agri/ forest residue + waste 3G = Grow bio-feed/ grass + algae
Product	Biodegradable or compostable Eliminate plastic waste
Fossil	PCL + PBAT
Bio	PLA + PBS
Process	Fermentation to alcohol to chemicals Pyrolysis to bio-naphtha to cracker Gasification to syngas to chemicals
Alcohol	Ethanol \rightarrow C ₂ = \rightarrow Bio PE I-butanol \rightarrow C ₃ = \rightarrow Bio PP BDO + PTA \rightarrow Bio polyester



\Rightarrow C circularity in materials

Transition materials

Transition	Battery + solar materials Membranes + separators Electrolytes + electrodes
Electronics	Encapsulant : EVA / POE Display : Polyfluorene Casing : Polycarbonate Screen : PMMA
Energy chem.	Solar PV : Chlorosilane Battery chemical : NMP Electrolyte : Carbonates



⇒ **Materials for energy transition**

E - chemicals

Feed

$\text{CO}_2 + \text{H}_2 = \text{syngas}$

Cost-competitive H_2

Reverse water gas shift

Product

Syngas = e-chemicals

Methanol / MTO + acetic acid

Cracker feed / e-naphtha + e-LPG

Turquoise H_2

$\text{CH}_4 = 2\text{H}_2 + \text{C}$

Valorise C

Carbon black / Graphite

Acetylene / PVC

C nano tubes / C - FRP



⇒ **Materials beyond Net Zero**



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Thank You