

Chemical Catalysis

with

Ion Exchange Resins

Purolite Ion Exchange Resins

Chemical Catalysis

with ion exchange resins

◆ What are Catalysts ?

- Decrease the activation energy of reactions
- Participate in reaction without being consumed
- Can be Acidic or Basic
- Have to be separated from reaction mixture
- Liquid or solid

Chemical Catalysis

with ion exchange resins

◆ Advantages

- No separation steps
- High conversions and yields
- Continuous production
- Low temperature reactions
- Fewer byproducts

Chemical Catalysis

with ion exchange resins

◆ Common Applications

- Etherification
- Phenol Related Catalysis
- Esterification
- Polymerization

Chemical Catalysis

with ion exchange resins

◆ Etherification

- MTBE
- ETBE
- TAME

Chemical Catalysis

with ion exchange resins

◆ MTBE (methyl tertiary butyl ether)

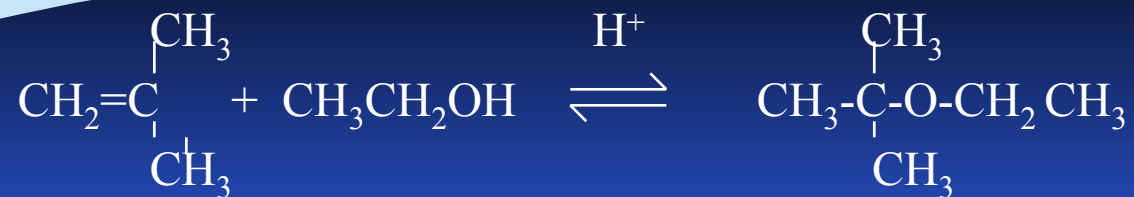
- Reaction



Chemical Catalysis

with ion exchange resins

◆ ETBE (ethyl tertiary butyl ether)



Chemical Catalysis

with ion exchange resins

◆ TAME (Tertiary Amyl Methyl Ether)



Purolite Ion Exchange Resins

Chemical Catalysis

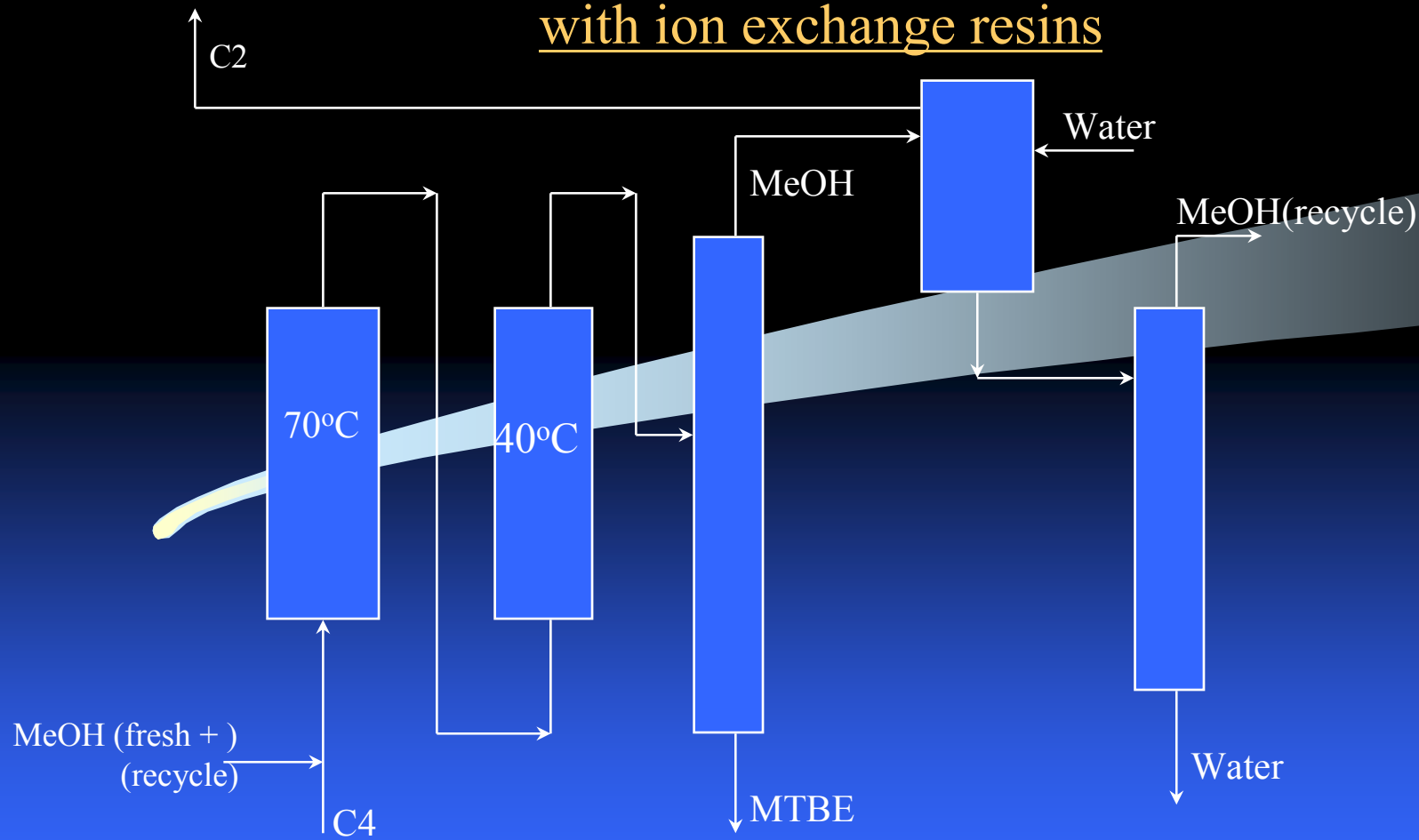
with ion exchange resins

◆ Phenol Applications

- ◆ Alkylation
- ◆ Dealkylation
- ◆ Purification
- ◆ Production of Bisphenol Acetone

Chemical Catalysis

with ion exchange resins



Puro~~l~~ite Ion Exchange Resins

Chemical Catalysis

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- ◆ MTBE ; ETBE ; TAME Technology Suppliers

UOP, ARCO, CD TECH, HULS, Phillips Petroleum

Snamprogetti, IFP, Edeleanu

Chemical Catalysis

with ion exchange resins

- ◆ Phenol Alkylation/Dealkylation Technology

HULS

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Chemical Catalysis

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- ◆ Phenol Purification Technologies

HULS, Kellogg, Allied Chemicals, GE, Lumas

Chemical Catalysis

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- ◆ Bis-Phenol Acetone Technologies

GE, Shell, ICSO, Dow, Bayer

Chemical Catalysis

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◆ Esterifications

- Diethyl Maleate
- Methyl Esters of Fatty Acids
- Dioctyl phthalate

◆ Technology by Davey

Chemical Catalysis

with ion exchange resins

◆ Silane Polymerization

- DOW CORNING

- HULS

Chemical Catalysis

with ion exchange resins

◆ Purolite Catalyst

Products are called “CT” = Catalyst Products

Example Purolite CT-175

Chemical Catalysis

with ion exchange resins

◆ Purolite Catalysts

CT-122 for BPA Synthesis

CT-124 for BPA Synthesis

CT-151 for Phenol Purification

CT-165 for Alkylation/Dealkylation

CT-169 for Esterification

CT-175 for MTBE, ETBE and TAME

CT-275 - High Activity CT-175

Chemical Catalysis

with ion exchange resins

- ◆ Operating Data to Collect
 - ◆ % Conversion (Each Reactor, Overall)
 - ◆ Temperature (Inlet, Outlet)
 - ◆ Feed Flow Rate
 - ◆ Methanol / Isobutylene Ratio
 - ◆ Moisture Content
 - ◆ Pressure Drop (Each Reactor)

Chemical Catalysis

with ion exchange resins

- ◆ **Stream Analysis** (Operating Data to Collect)
- ◆ **Feed into MTBE Unit**
Total Nitrogen (Nitriles + Ammonia), Metals,
Moisture
- ◆ **Feed into Water Wash**
Nitriles, Metals, Dienes
- ◆ **Recycled Methanol**
Nitriles, Moisture
- ◆ **Fresh Methanol**
Moisture, Formic Acid, Formaldehyde

Chemical Catalysis

with ion exchange resins

- ◆ Purolite Laboratory Support
- ◆ Samples of the Catalyst

Laboratory Analysis Confirms

- A) Permanent Deactivation of Catalyst
- OR
- B) Temporary Deactivation of Catalyst

Chemical Catalysis

with ion exchange resins

- ◆ Permanent Deactivation of Catalyst
 - ◆ Loss of Sulfonic Groups
 - ◆ Permanent Pore Blockage
 - ◆ Loss of Physical Integrity of Catalyst

Chemical Catalysis

with ion exchange resins

- ◆ Temporary Deactivation of Catalyst
 - ◆ Cation Exchange (Na, Ca, Fe, Cr, Al, Si)
 - ◆ Temporary Pore Blockage
 - ◆ Neutralization due to Ammonia, Amines & Nitriles

The End

Chemical Catalysis

with

Ion Exchange Resins

Purolite Ion Exchange Resins