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green chemical  
reaction engineering

catalytic processes for  
gas conversion

# Catalytic Processes for Gas Conversion

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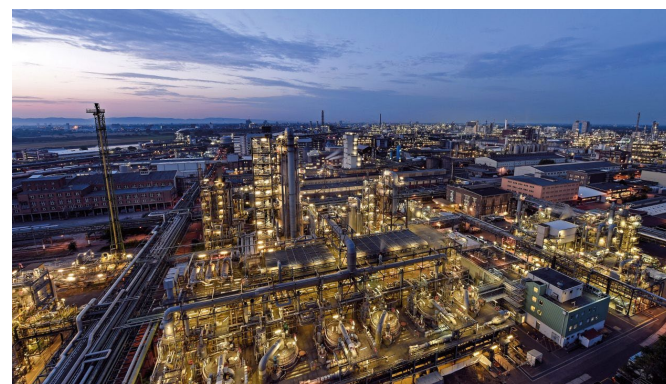


# New catalysts and processes for production at different scale

Large scale, integrated petrochemical complexes due to economy of scale



Exxon Mobil's largest integrated manufacturing complex located in Singapore



BASF's largest verbund site located in Ludwigshafen, Germany

Small scale, decentralized chemical plants closer to alternative feedstocks



Fulcrum bioFuels plant located in Nevada, USA  
Strategically located adjacent to waste landfill





# Vision and strategies

## 1. Sustainable carbon feedstock

(only viable with green H<sub>2</sub>):

Industrial CO<sub>2</sub>, flue gas, biogas, municipal waste

Includes natural gas (no green H<sub>2</sub>)

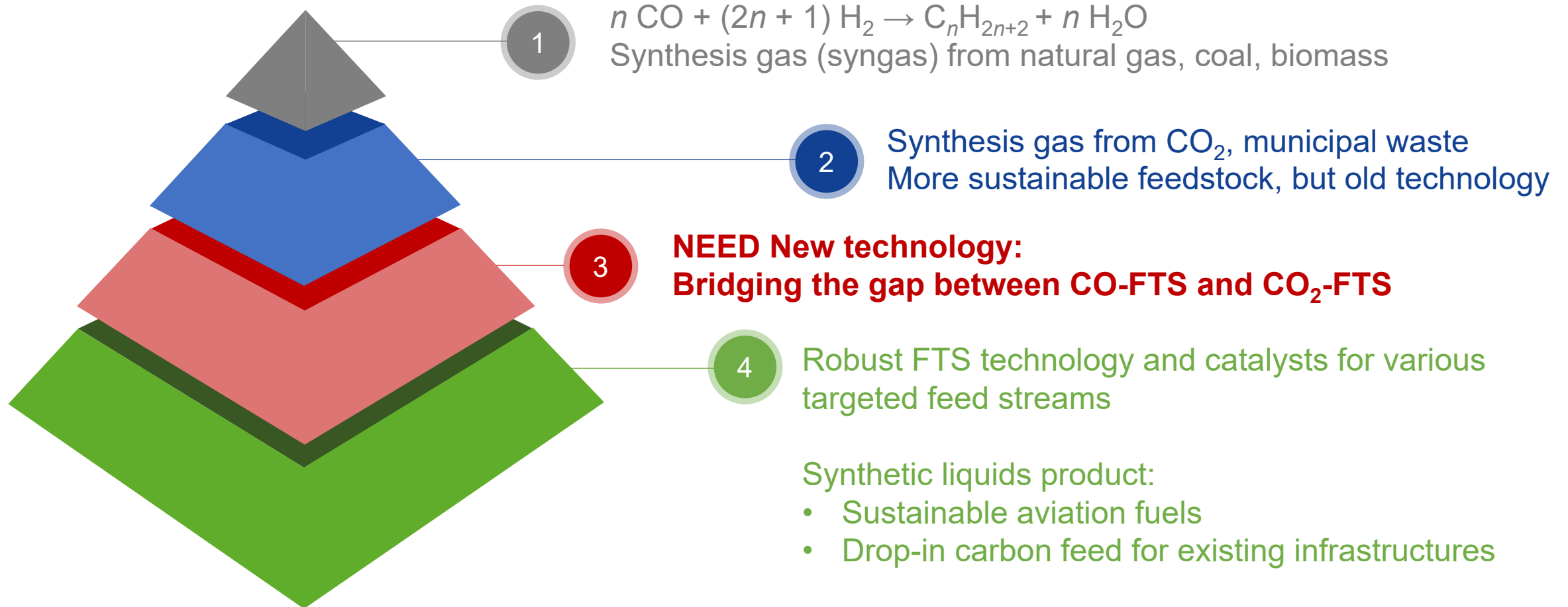
## 2. Waste stream processing/ upgrading

- Impure/ mix streams = requires purification/ separation = higher costs
- Depends on scale of operation

## Research themes in my group: robust catalysts and direct processes

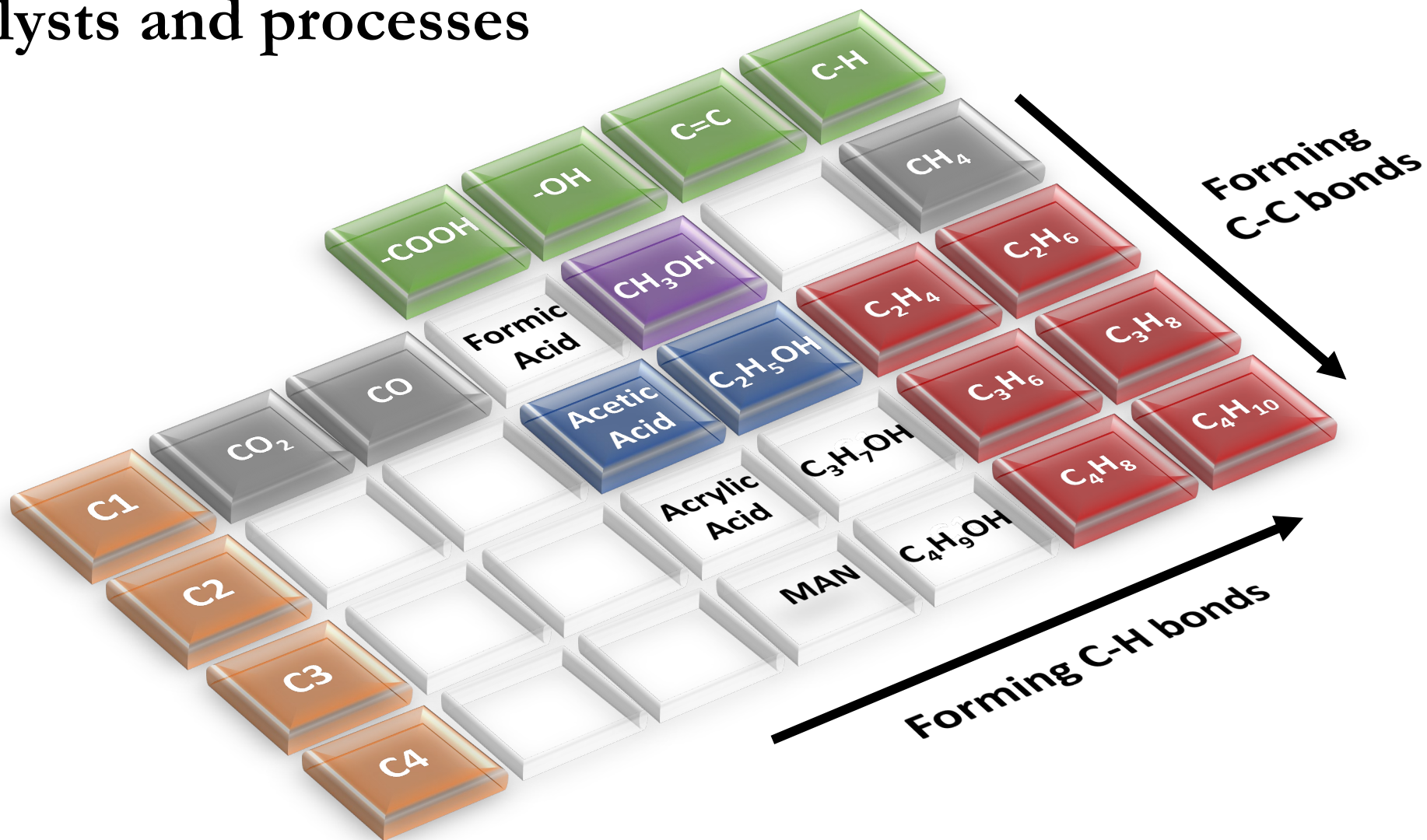
1. 'drop-in' synthetic fuels vis Fischer-Tropsch Synthesis (FTS)
2. new catalysts and processes for CO<sub>2</sub>/CO to chemicals
3. 'drop-in' synthetic fuels and chemicals via plastics recycling – partnership with Prof. Erik Heeres

# Synthetic fuels via Fischer-Tropsch Synthesis



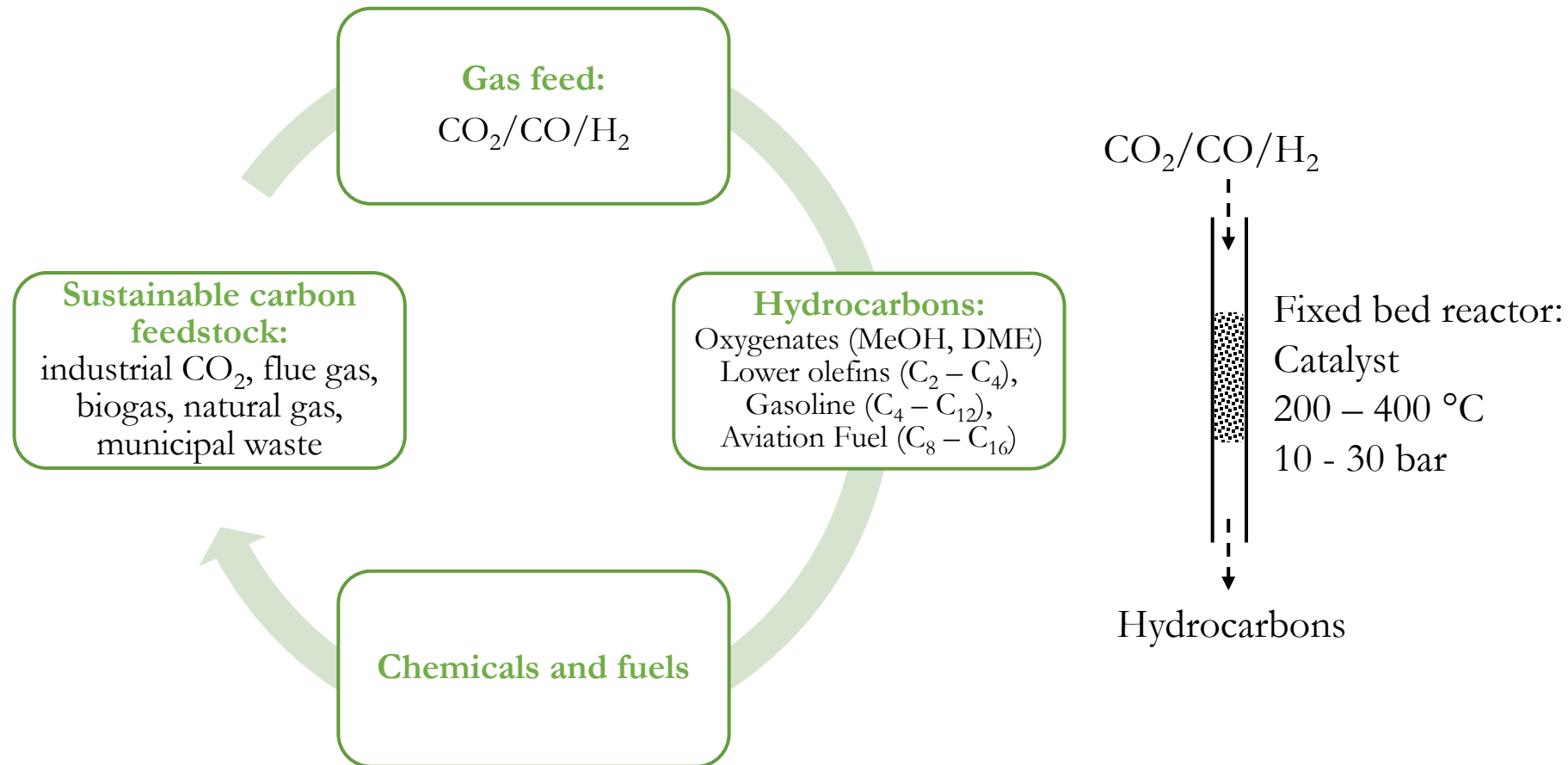


# New catalysts and processes





# Catalytic Processes for Gas Conversion





# Team

## Lower olefins to aromatics



Paresh Butolia  
PhD candidate  
09/20 to 09/24

## CO<sub>2</sub>/CO/H<sub>2</sub> to aviation fuels (Fischer-Tropsch Synthesis)



Bart de Jong  
PhD candidate  
04/21 to 04/25



Weixin Meng  
PhD candidate  
10/21 to 10/25

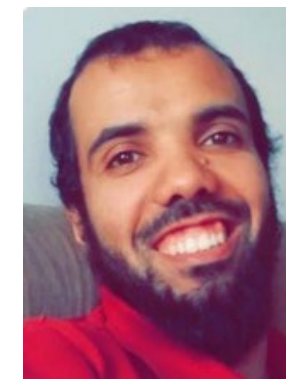


Filip Luedtke  
MSc student  
09/21 to 05/22

## CO<sub>2</sub>/CO/H<sub>2</sub> to methanol



Adam Tehenic  
MSc student  
09/21 to 05/22



Sabitan Alharbi  
PhD candidate  
Early 2022