SPICE – Sustainable Process Intensification, Catalysis and Reaction Engineering Group

Department of Chemical Engineering
Bogazici University

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Located at the North Campus Science & Technology Building Lab: KB–404

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Primary Research Objective

Develop novel catalysts, reactors and process intensification strategies for valorizing renewables and CO_2 to value added fuels and chemicals.

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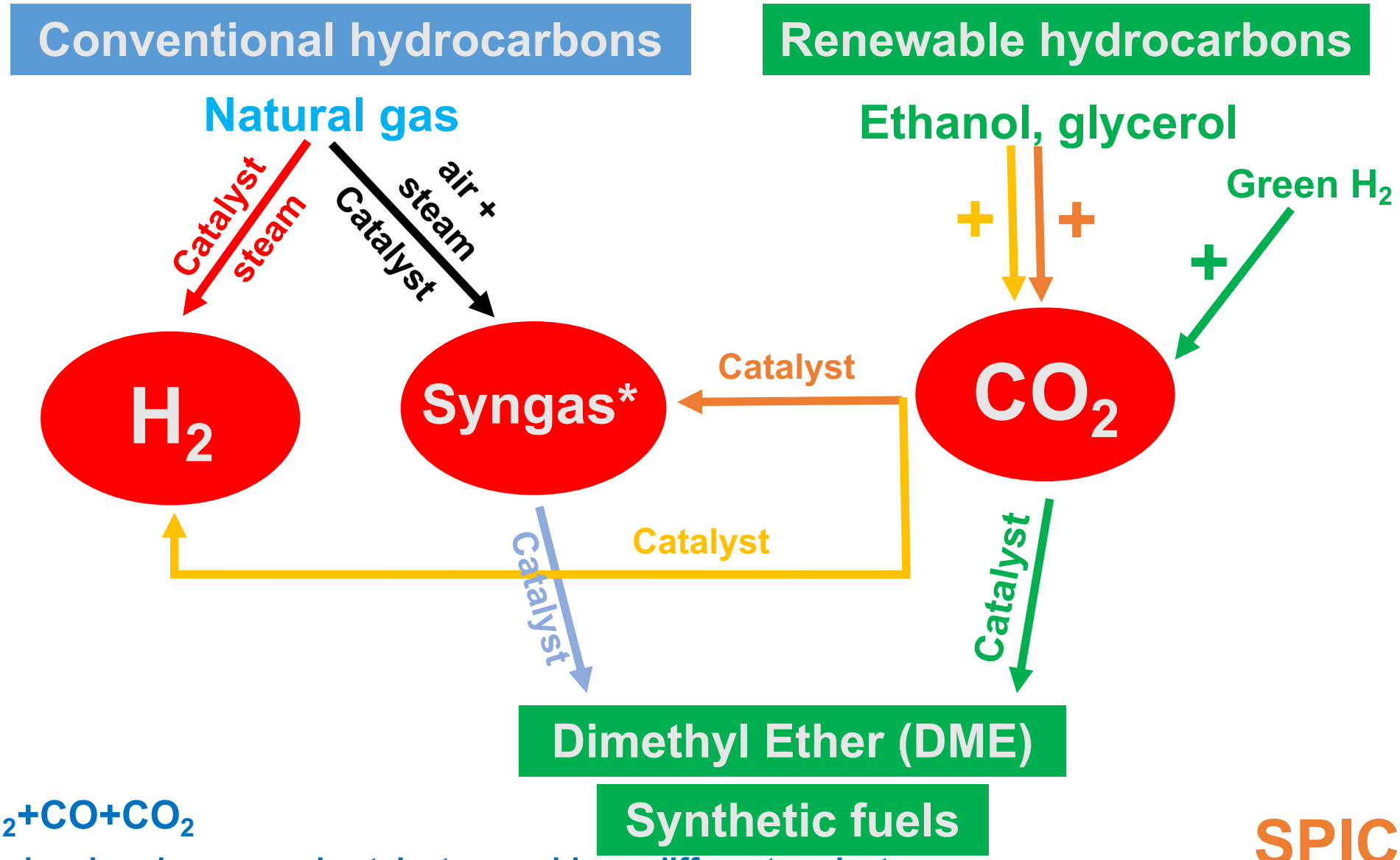
Research Themes



*H_2+CO+CO_2

*Each colored arrow and catalyst resembles a different project

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Research Tools & Capabilities

Advanced modeling at reactor and process scales

- Intensified, multifunctional microreactors
- Heat-exchange integrated microreactors
- Membrane microreactors

for key catalytic processes

- demanding precise heat management
- limited by thermodynamics

EXAMPLES

- **Fischer-Tropsch synthesis**
- **Green NH_3 synthesis**
- **CO_2-to-DME**
- **Syngas-to-DME**
- **Renewables-to-syngas/H_2**
- **Micro fuel processors for H_2 generation for Fuel Cells**

Catalyst synthesis and characterization
Catalyst testing in conventional and structured reactors

EXAMPLES

- **CO_2-to-DME**
- **Syngas-to-DME**
- **Renewables-to-syngas/H_2**
- **C_1-C_3 hydrocarbons to syngas/H_2**

Process Intensification (PI) Strategies

- **Sorption enhancement (SE)**
- **Heat transfer enhancement strategies in packed-beds**

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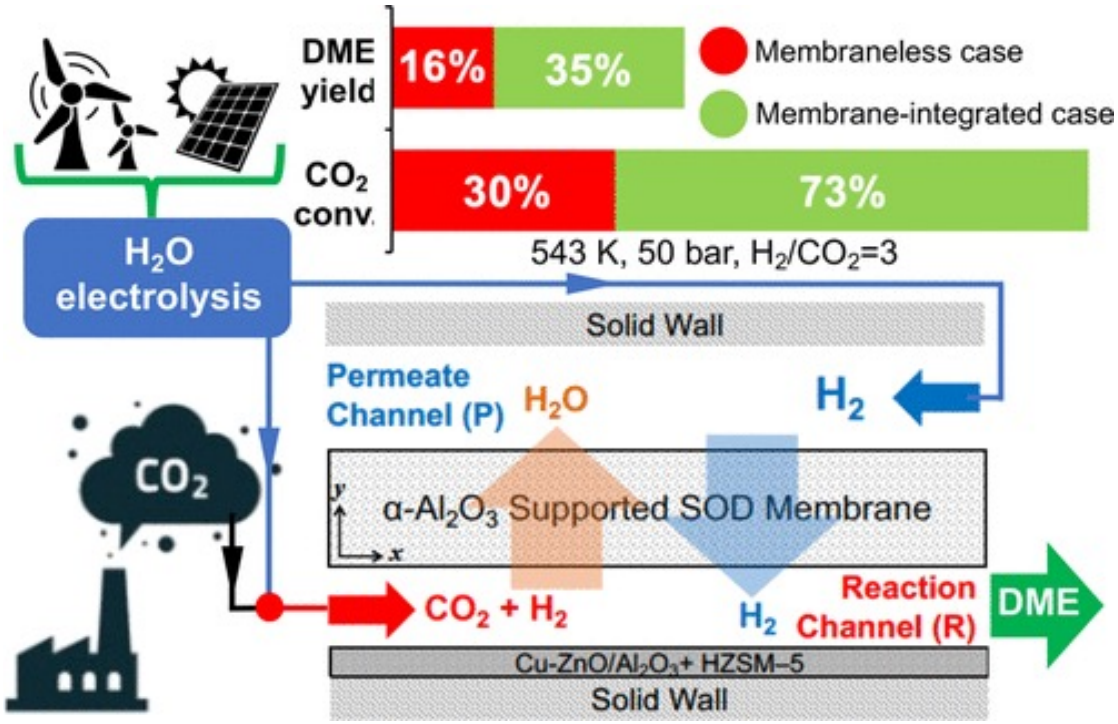
Key findings / Intensified DME synthesis



Modeling of reaction & membrane separation in microchannel domain



Selected publications:

Catalysis Today, 418 (2023) 114130 (IF: 6.766)

Catalysis Today, 383 (2022) 133-145 (IF: 6.766)

I&ECR, 61 (2022) 10846-10859 (IF: 4.326) / Open Access

Journal of CO_2 Utilization, 52 (2021) 101660 (IF: 8.321) / Open Access

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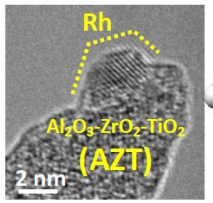
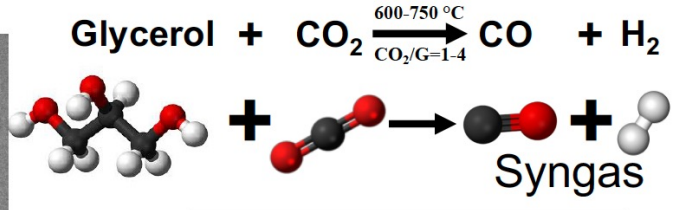
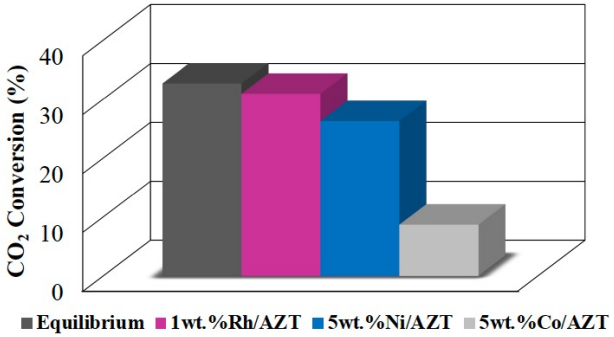
Glycerol-to-syngas

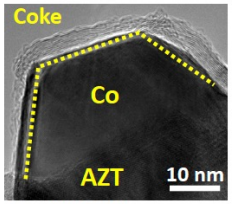


Rh/AZT

- No Coking
- No Sintering
- High Conversion
- High Stability

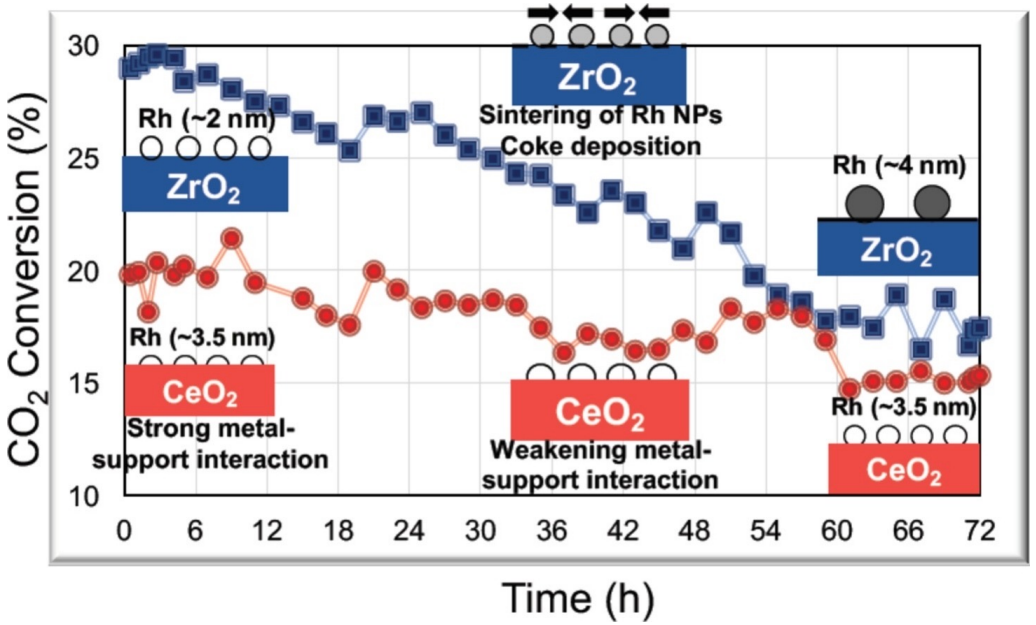






Co/AZT

- Severe Coking
- Severe Sintering
- Low Conversion
- Low Stability



Catalytic CO_2 reforming of glycerol, a waste of biodiesel synthesis, to syngas, a value added platform mixture

Selected publications:

Journal of CO_2 Utilization, 67 (2023) 102329 (IF: 8.321)

Applied Catalysis A: General, 636 (2022) 118577 (IF: 5.723)

Applied Catalysis B: Environmental, 256 (2019) 117808 (IF: 24.319)

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Research projects

TUBITAK* Funded Projects (>2.5M TL)

- 1001 projects (1 ongoing, 3 completed)
- 1003 project (1 completed)

Industrial research projects (~4M TL)

- 4 completed
- TUPRAS, SOCAR, Roketsan

BAP** Funded Projects (~1M TL)

- 1 ongoing, 8 completed

*The Scientific and Technological Research Council of Turkey

**Bogazici University Research Fund

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The Team

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Principal Investigator

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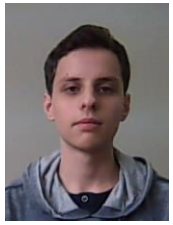
Mert Ozden

Semih Altınsoy

MSc students



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