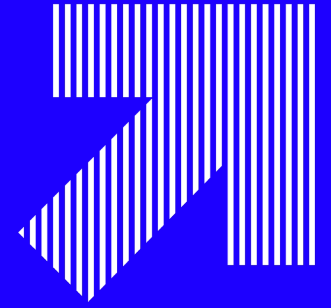




**UNIVERSITÀ
DEGLI STUDI
DI UDINE**

hic sunt futura

AREA SERVIZI
PER LA RICERCA

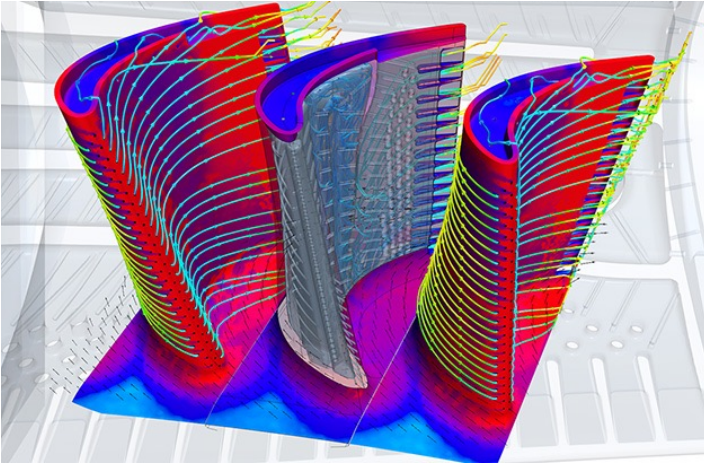


PHD IN ENERGY AND ENVIRONMENTAL ENGINEERING SCIENCE

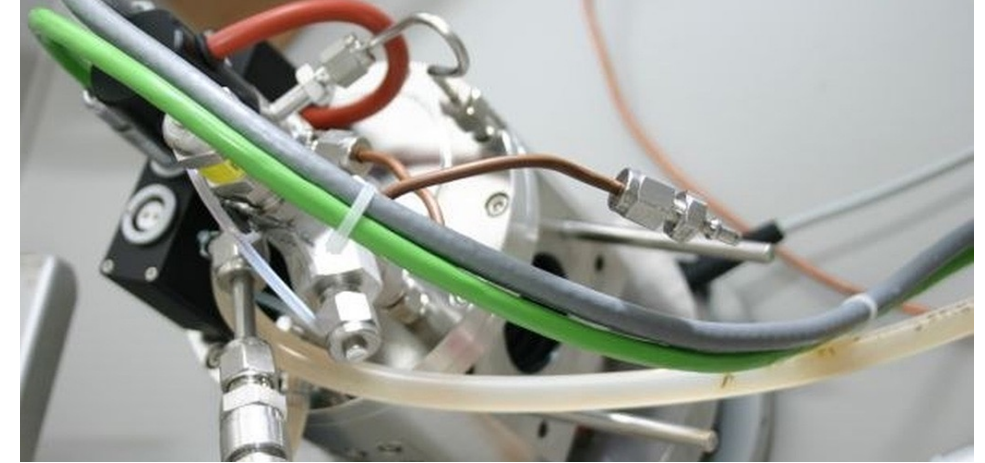




Heat and Fluid Flow



Materials and Chemical Processing



Energy Management and Energy Optimization

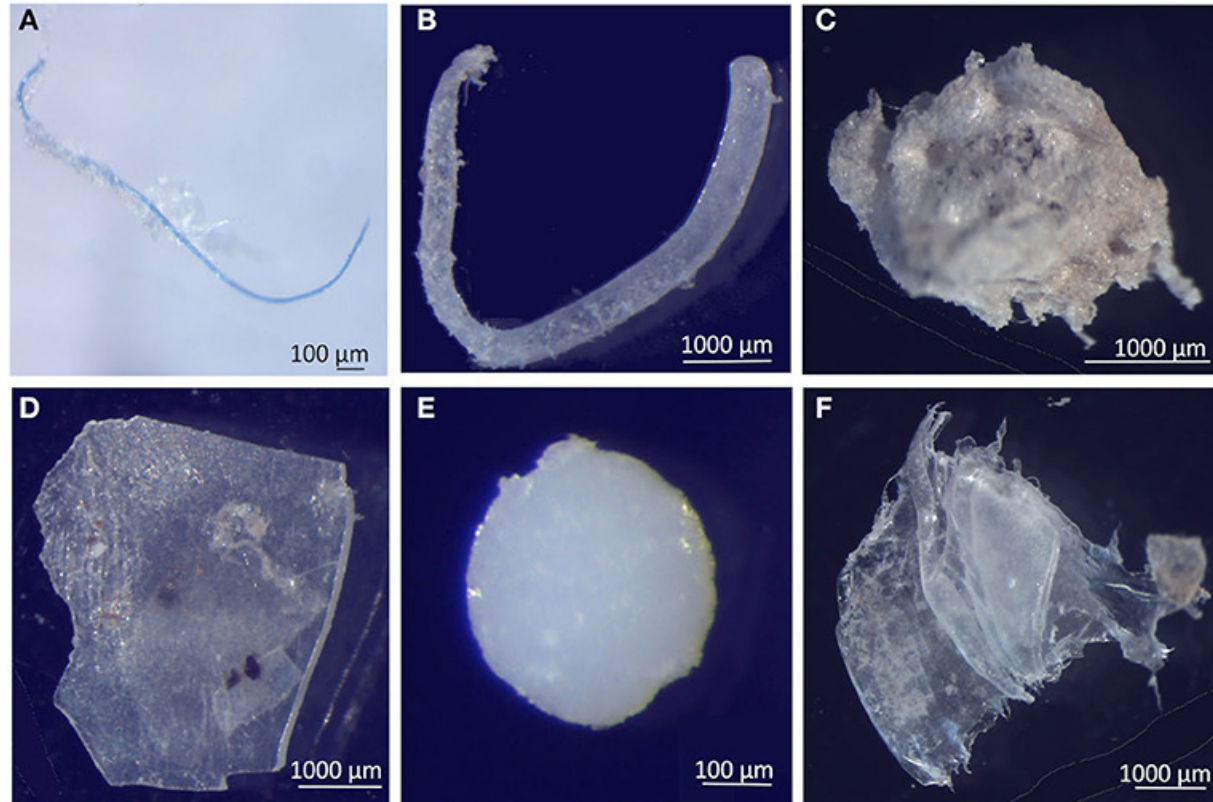




Overview of Problems and Applications

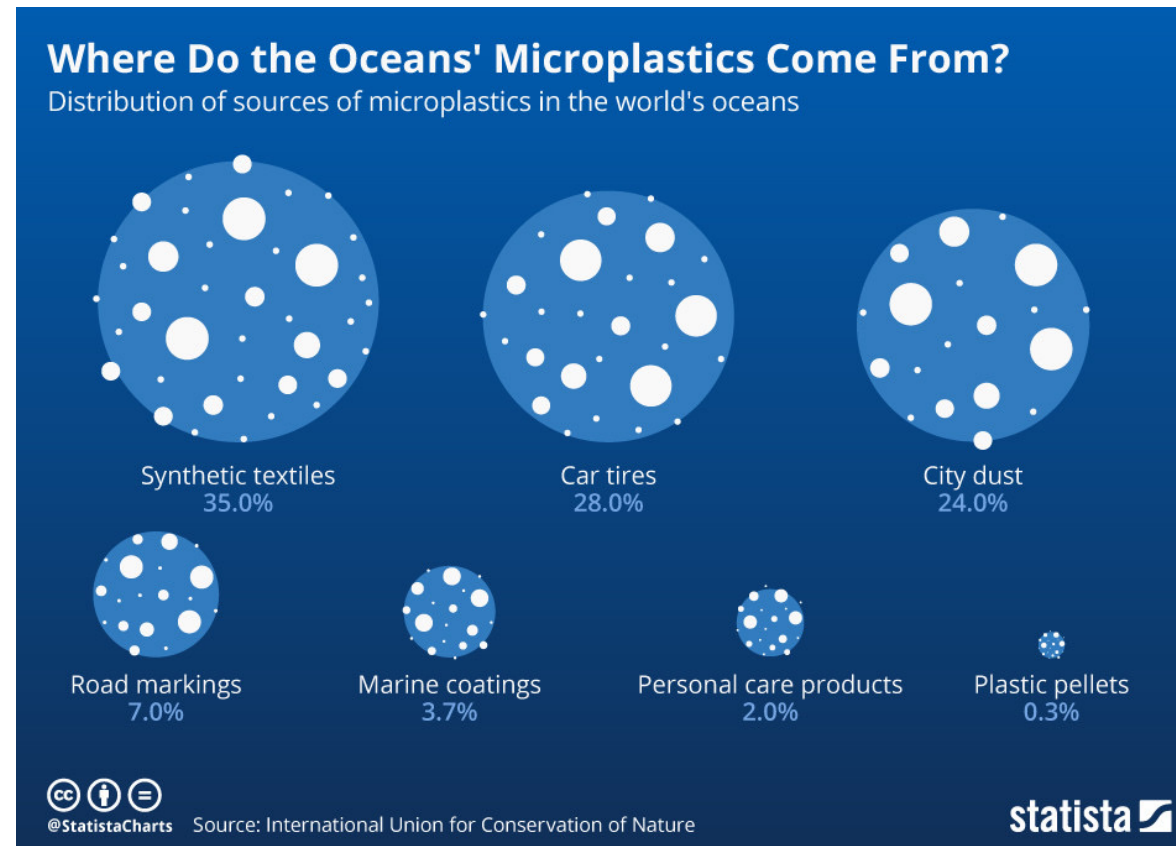


Heat and Fluid Flow Area: Microplastic Pollution





Heat and Fluid Flow Area: Microplastic Pollution

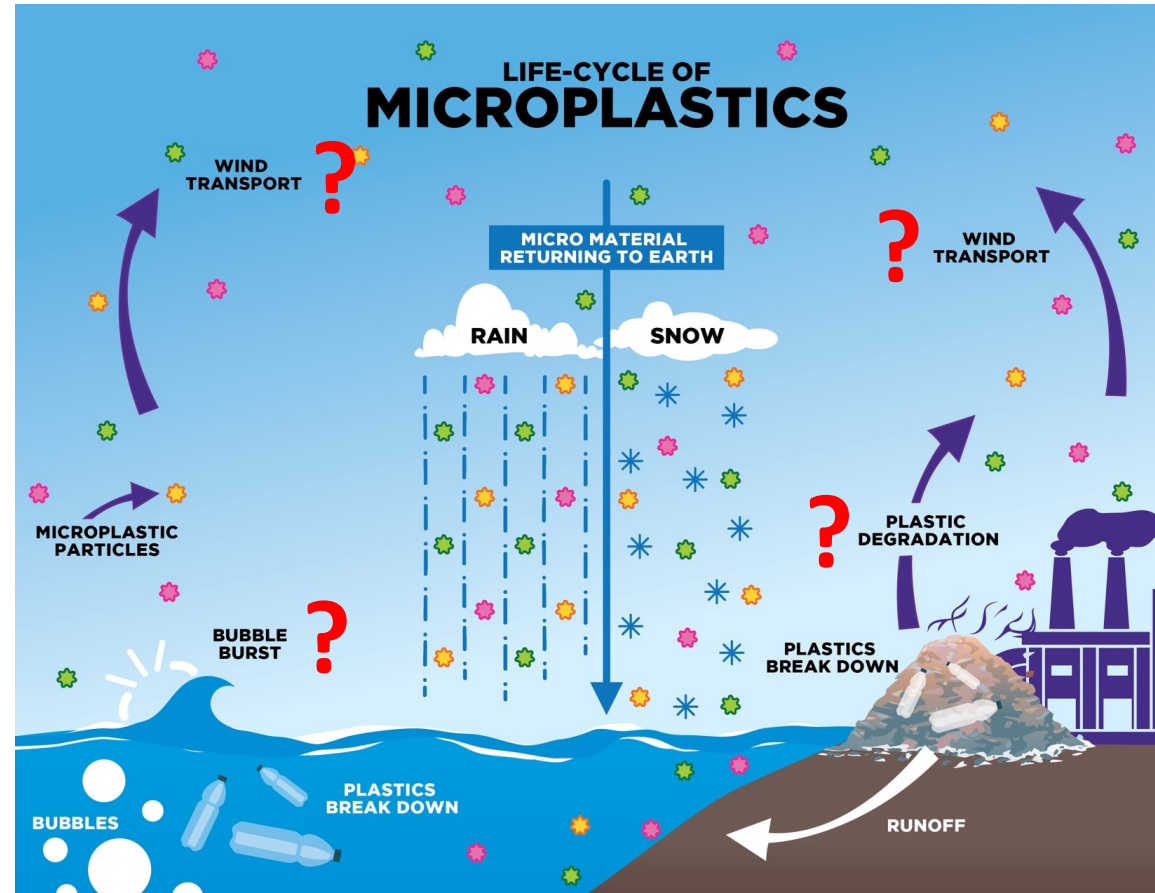




Overview of Problems and Applications



Heat and Fluid Flow Area: Microplastic Pollution





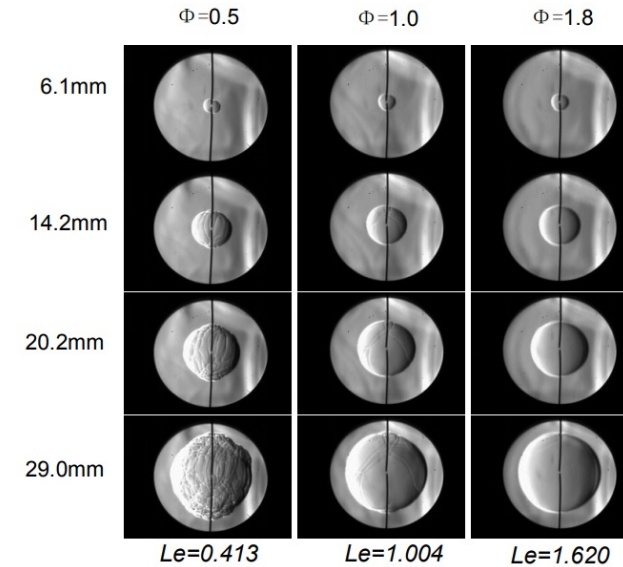
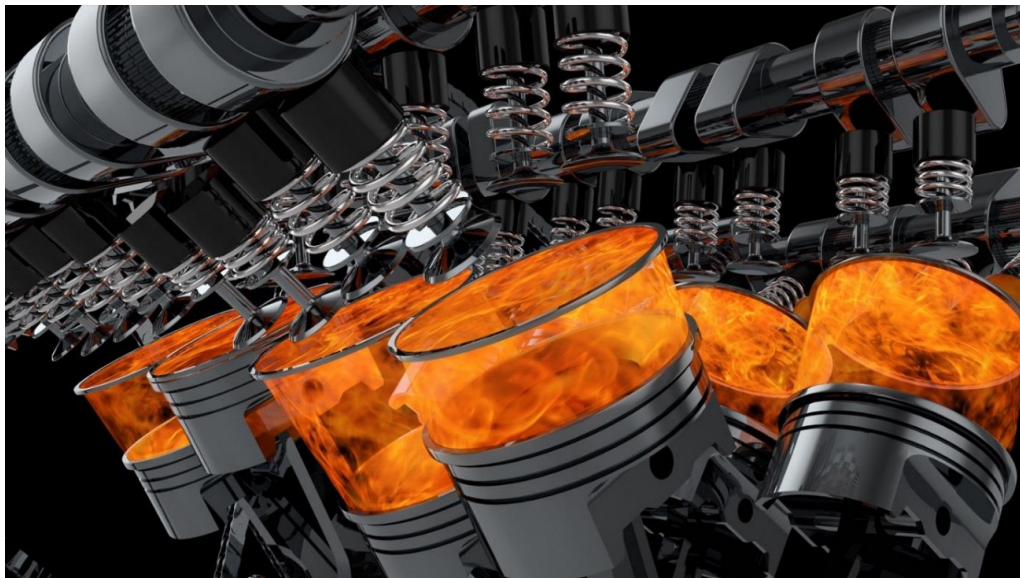
Heat and Fluid Flow Area: Internal Combustion Engines

Modelling combustion in **injection engines**:

- Flame injection and evolution
- Turbulent combustion

Innovative **Internal Combustion Engines**:

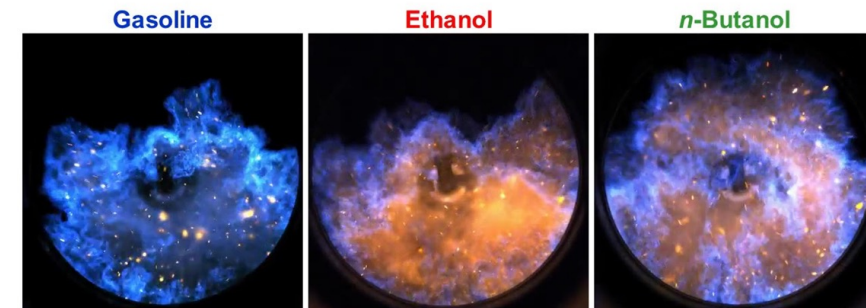
- HCCI (Homogeneous-Charge Compression Ignition)
- RCCI (Reactivity-Controlled Compression Ignition)



Combustion instabilities in H_2 /air flames

Spark-Ignition Engine Combustion
Different Fuels

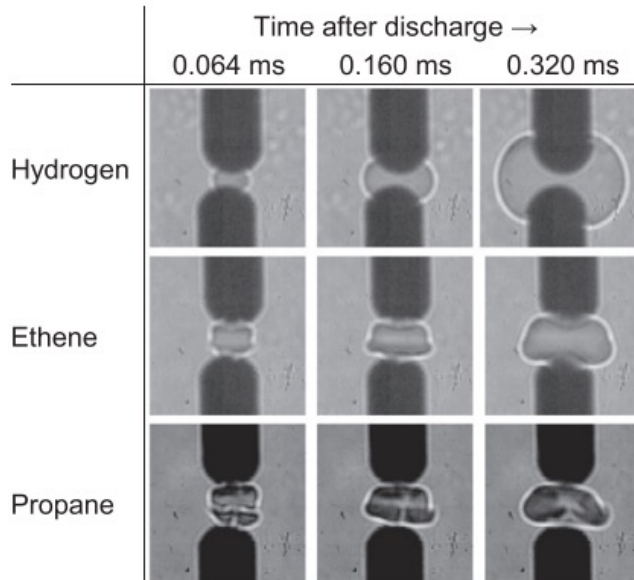
Imperial College
London



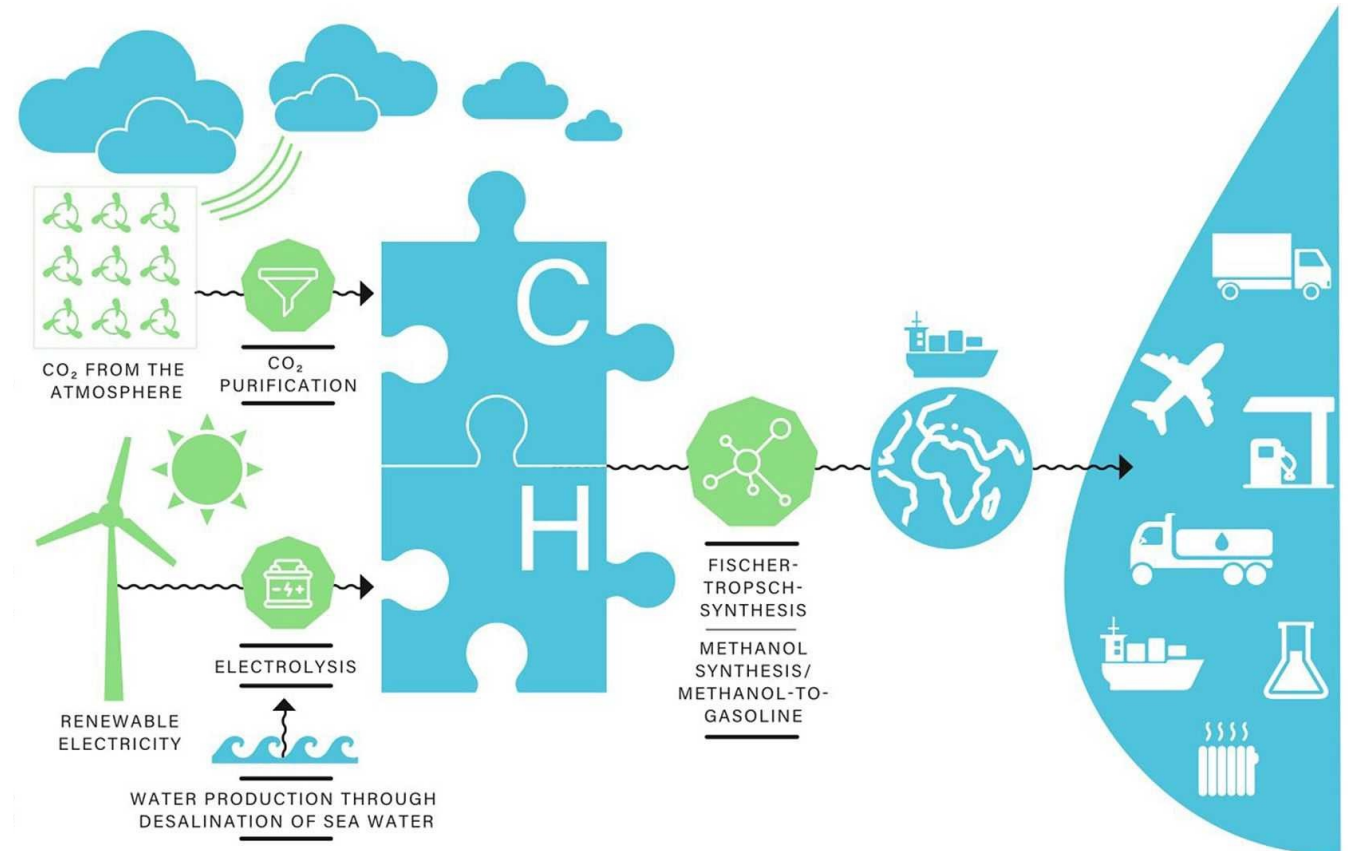


Heat and Fluid Flow Area: E-Fuels

- Basic fuels: **hydrogen**, methane, propane
- Fuel blends: gasoline, diesel fuel, TRFs
- **Alcohols**: ethanol, methanol, butanol
- **Biofuels, e-fuels**



Flame kernel development near minimum ignition energy



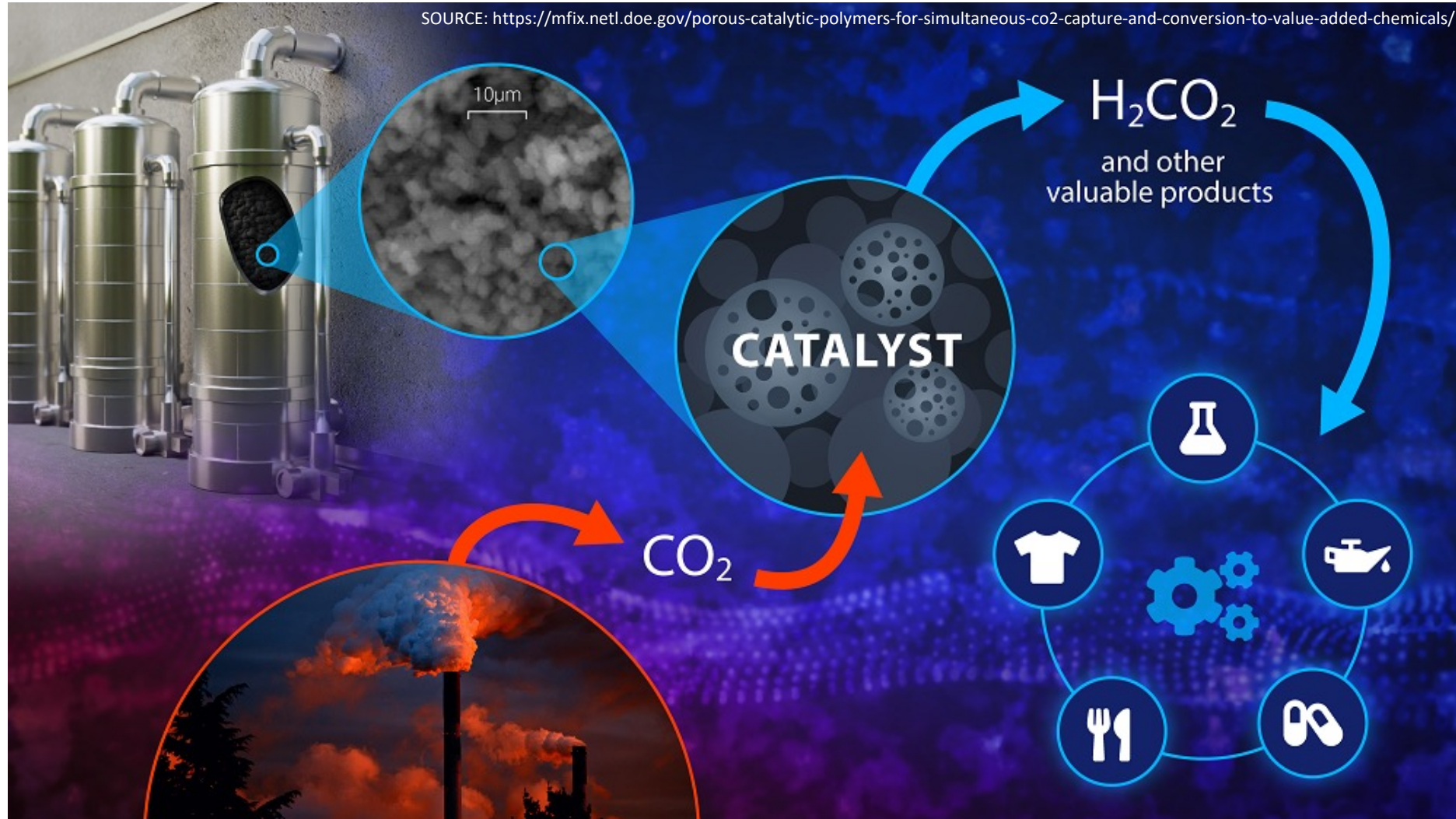
e-fuel production



Overview of Problems and Applications



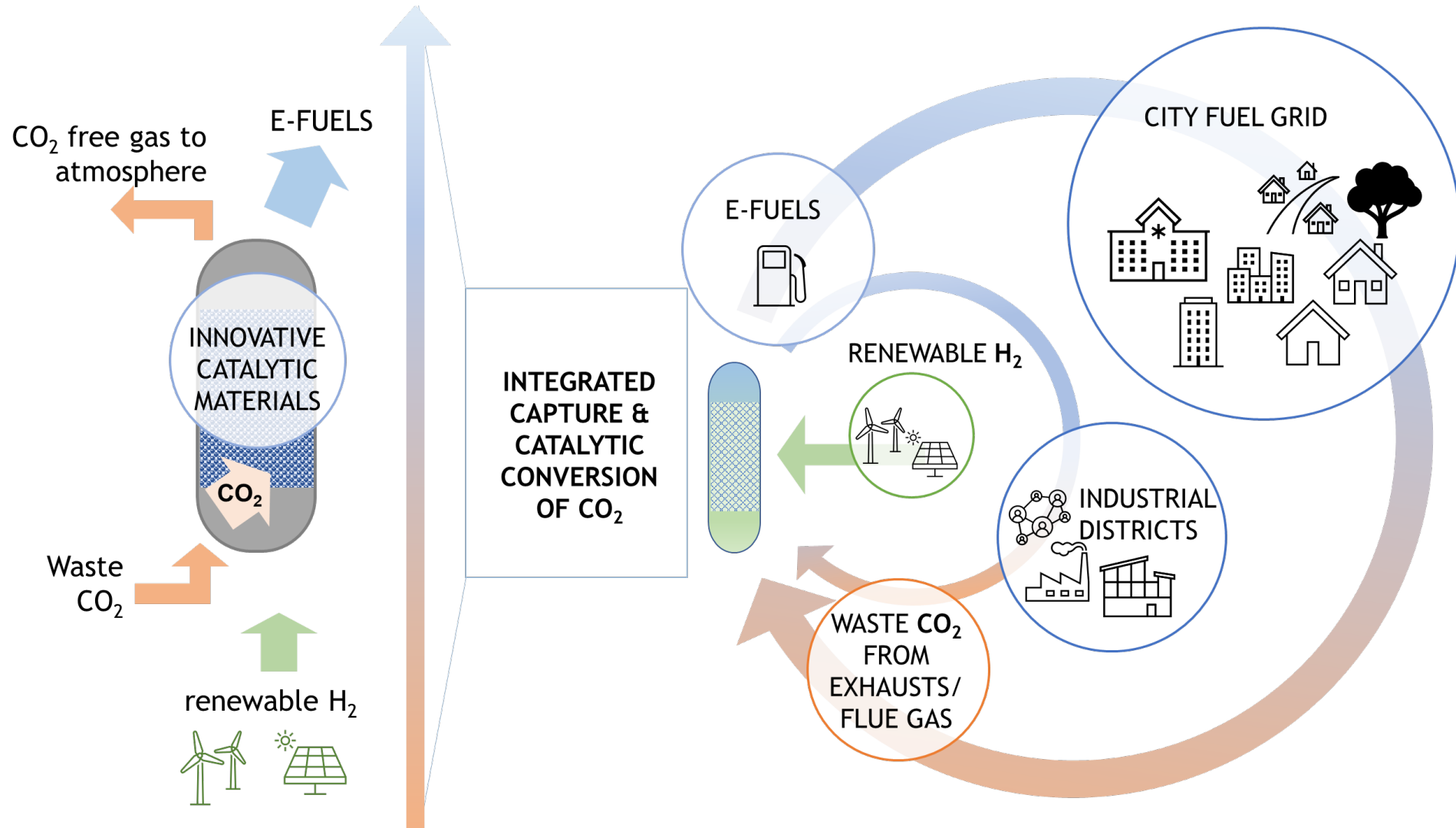
Materials and Chemical Processing Area: Catalytic CO₂ conversion



Overview of Problems and Applications



Materials and Chemical Processing Area: Catalytic CO₂ conversion





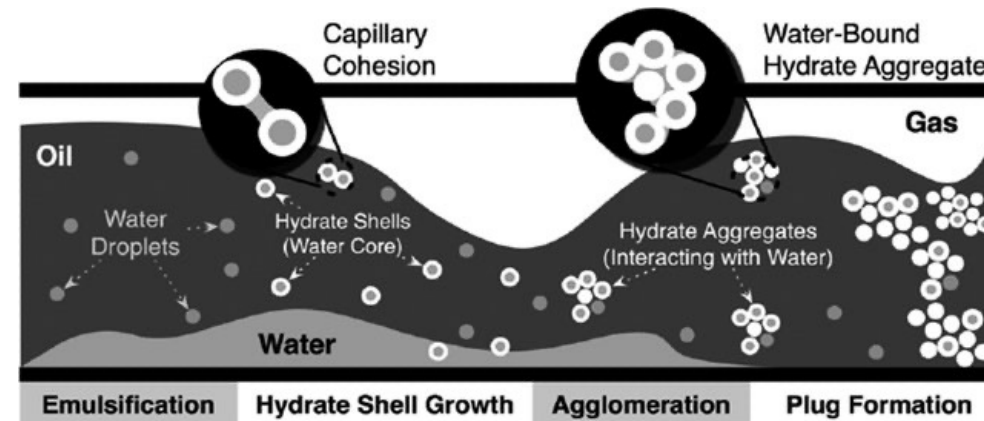
Area Materials and Chemical Processing: Pipelines

Main problems to be tackled:

- Deposition of paraffins and gas hydrates



Kirkuk-Ceyhan pipeline

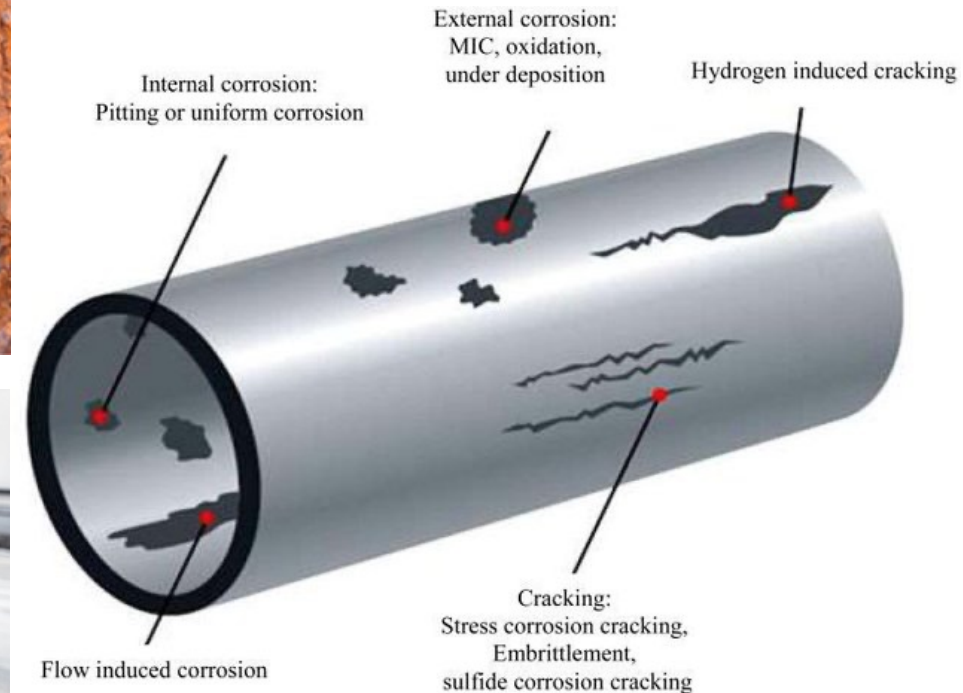




Area Materials and Chemical Processing: Pipelines

Main problems to be tackled:

- Corrosion





Materials and Chemical Processing Area: Stiction in automotive braking systems

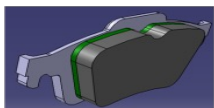
Braking system of a vehicle

Disco freno

Pastiglia freno



Stiction material



Fillers and
Abrasives
40-60% vol.



Al₂O₃,
ZrO₂,
Chromite,
Barite,
Vermiculite,
...



Phenolic
Resins

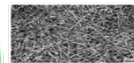
Organic Binder
10-20% vol.

MoS₂,
Graphite,
...



Solid
Lubricants
5-15% vol.

Fibers and
Rubber
5-20% vol.

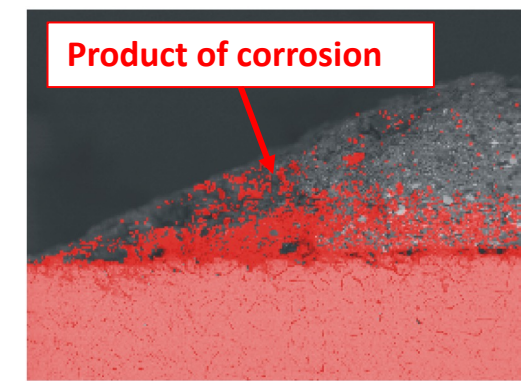
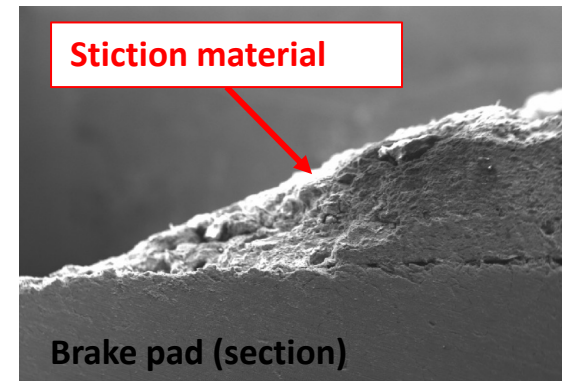
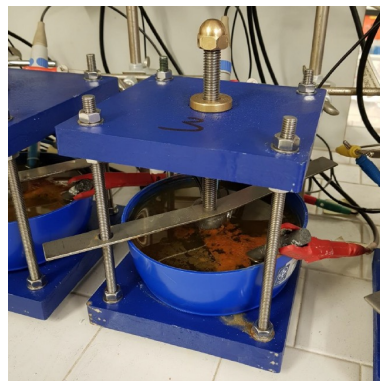


Metal fiber
Aramide
Glass fiber
...

Stiction: results from the adhesion of the brake pad to the disc brake of a vehicle (in static conditions)



Study of corrosion stiction phenomena: adhesion mechanism



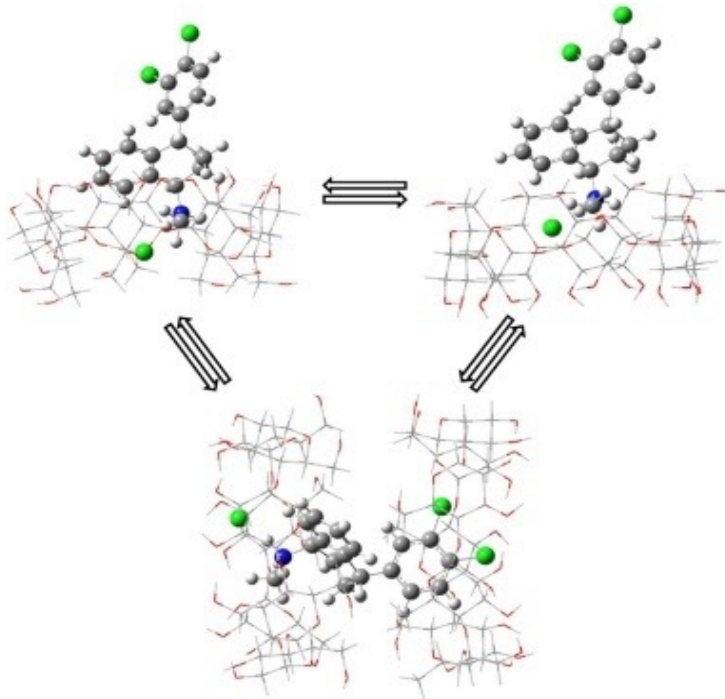
1mm



Materials and Chemical Processing Area: Removal and Transport of Pharmaceuticals

Pharmaceuticals in the environment = pollutants

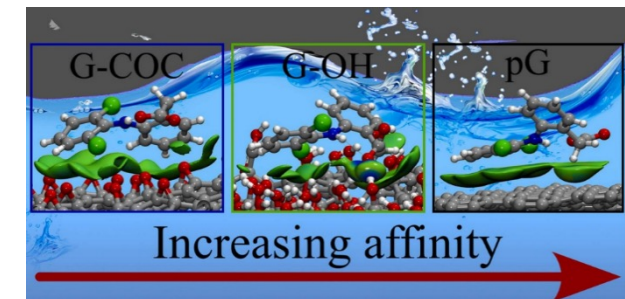
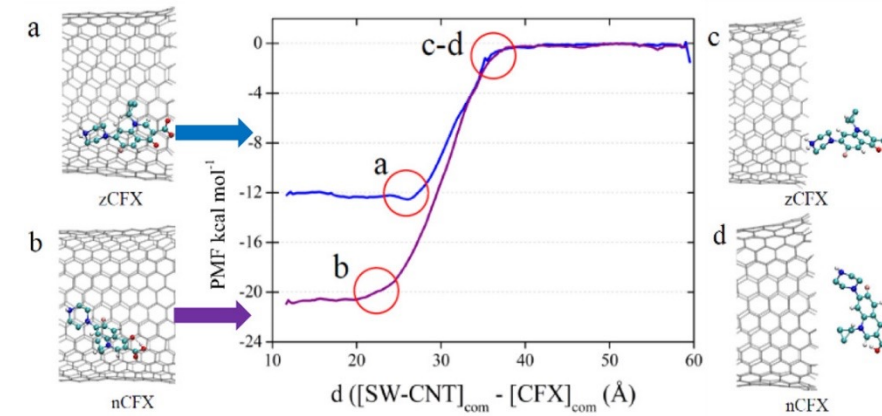
Materials for transport



Simulation of the interaction between pharmaceuticals and materials for their transport in formulations (**drug delivery**) and for their removal from the environment (**drug removal**)



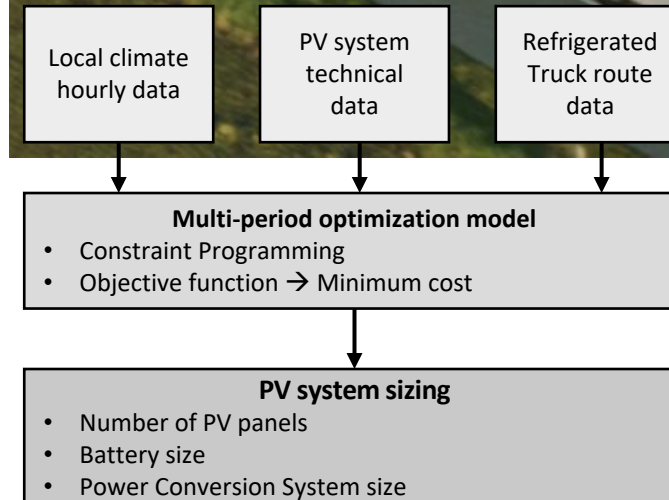
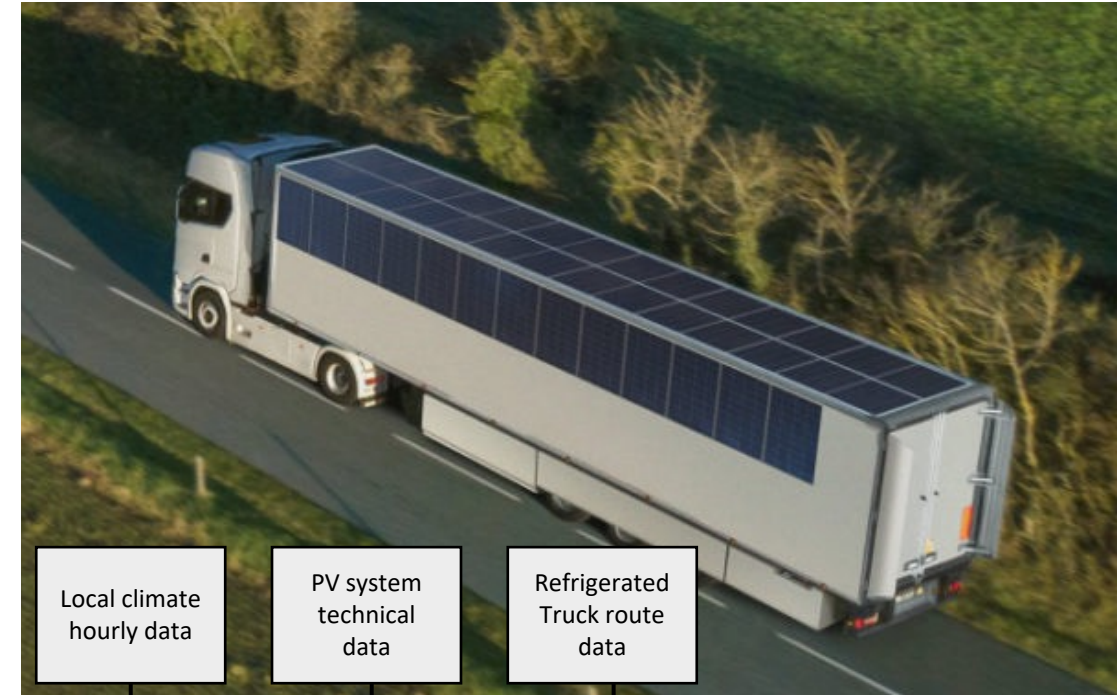
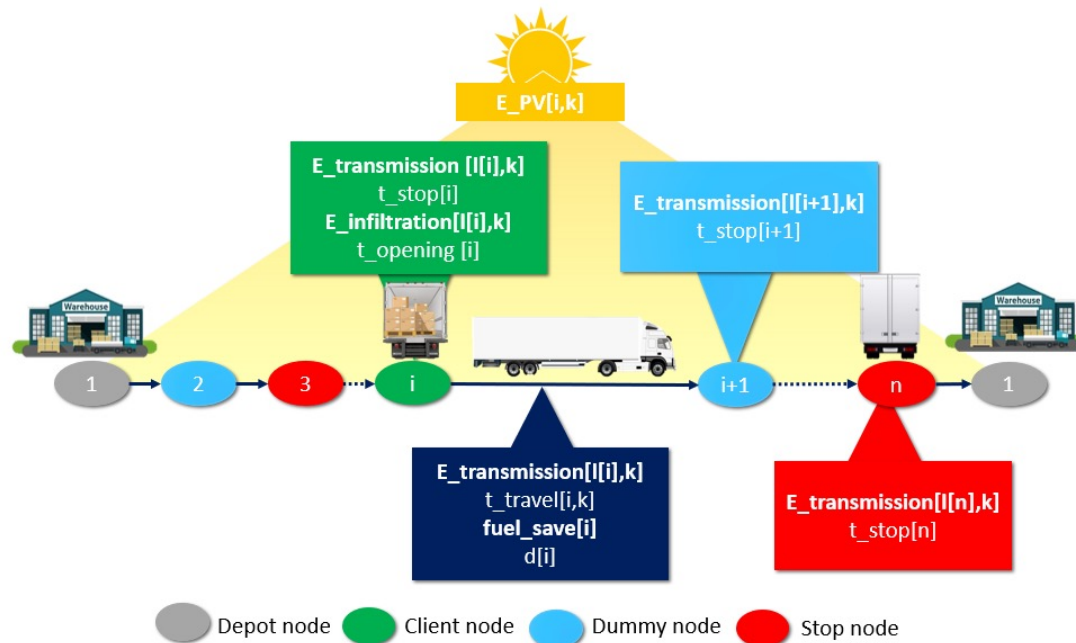
Materials for Removal





Energy Management and Optimization Area: Sustainable Logistics

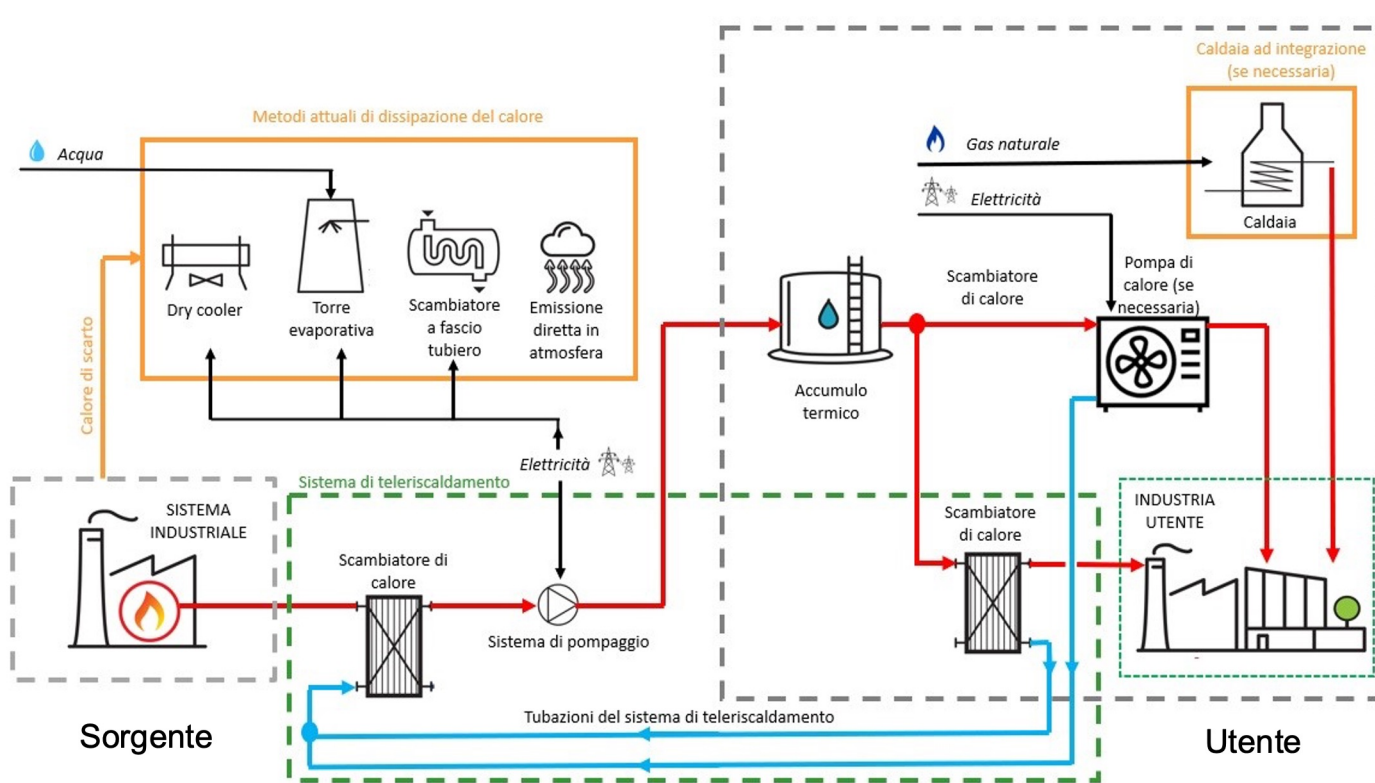
Integration of photovoltaics and transport refrigerated units





Energy Management and Optimization Area: Industrial energy symbiosis

Sharing energy flows in industrial ecosystems



Objectives:

Establishing new energy communities in industry



Main problems:

- Forecasting and matching load curves: demand and supply management
- Storage systems (thermal, batteries, hydrogen...)
- Calculation of carbon footprint and water footprint before and after intervention



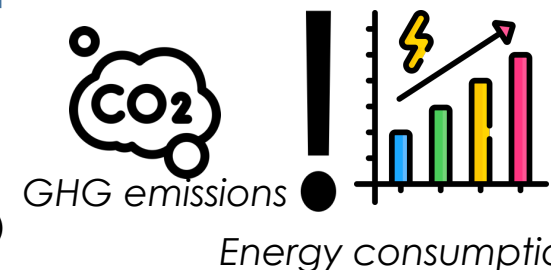
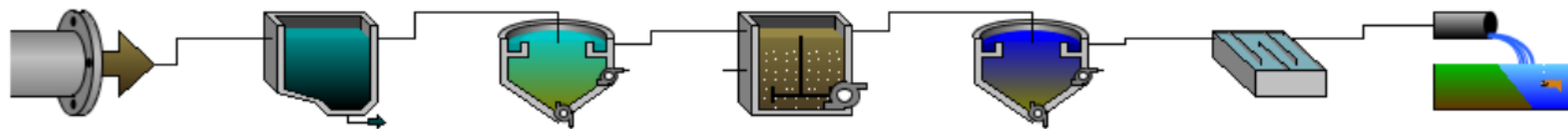
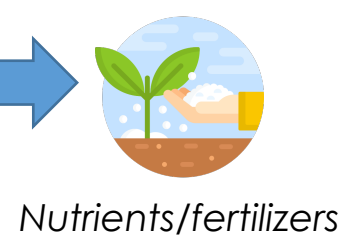
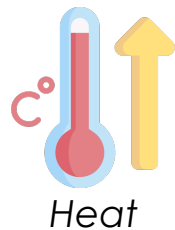
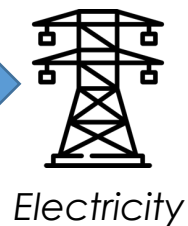
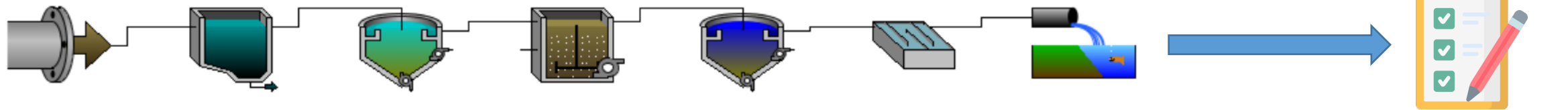
Example: Roncadin SpA



Energy Management and Optimization Area: Environmental Technologies - Recovery of Matter and Energy from the Integrated Water Cycle and Waste

Wastewater Treatment Plants (WWTPs)

Compliance with legal limits

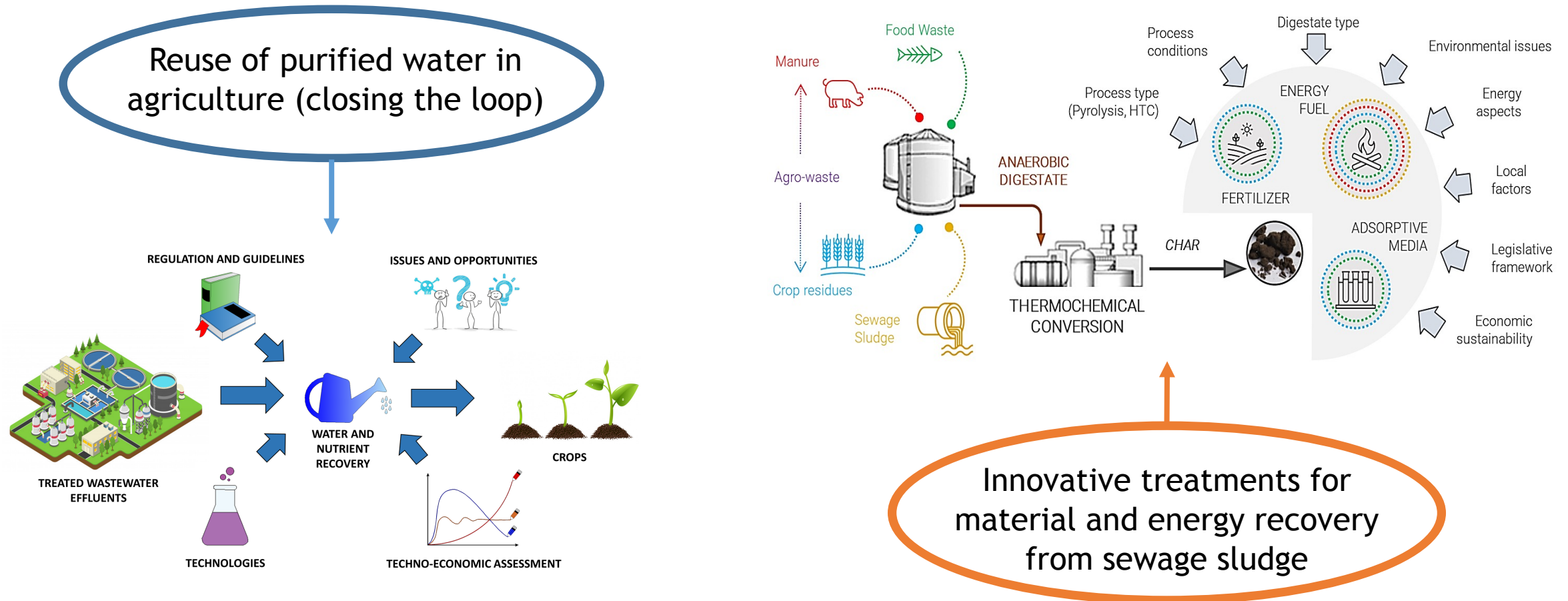


Water Resource Recovery Facilities (WRRFs)

Energy consumption



Energy Management and Optimization Area: Environmental Technologies - Recovery of Matter and Energy from the Integrated Water Cycle and Waste

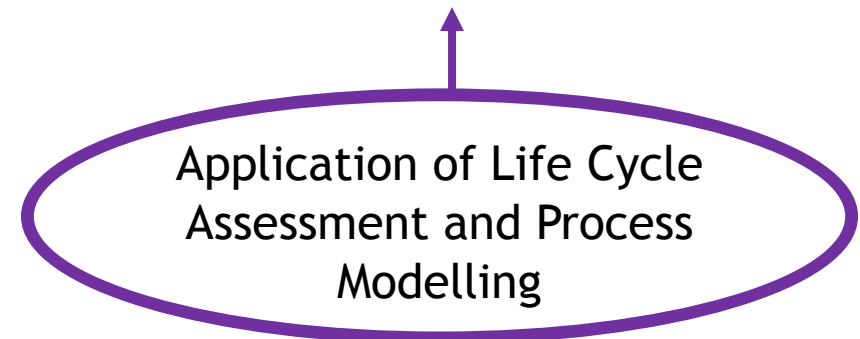
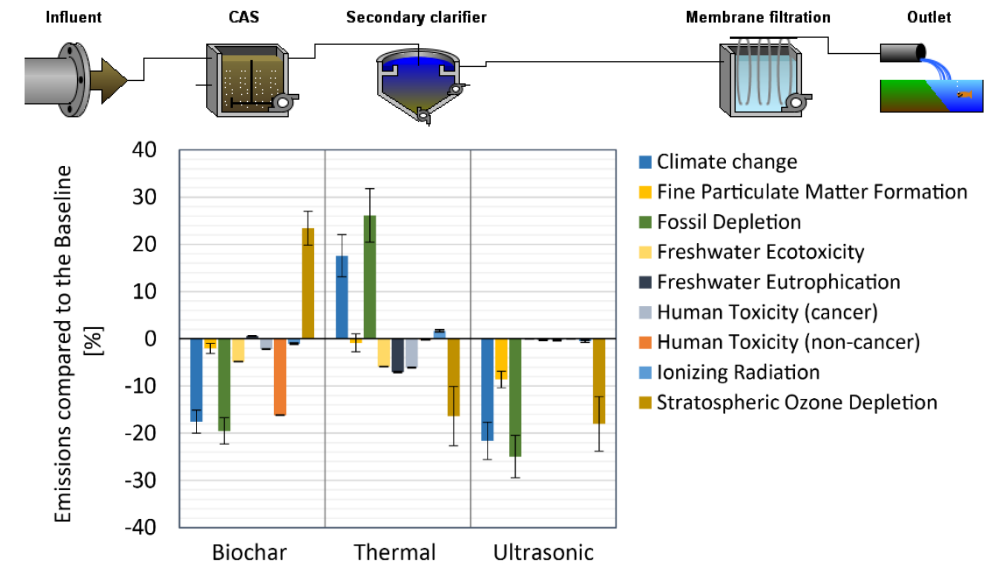




Overview of Problems and Applications



Energy Management and Optimization Area: Environmental Technologies - Recovery of Matter and Energy from the Integrated Water Cycle and Waste

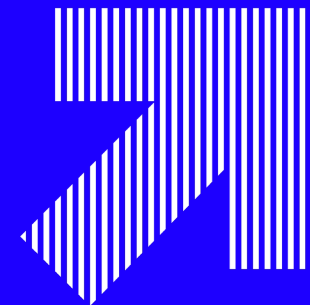




**UNIVERSITÀ
DEGLI STUDI
DI UDINE**

hic sunt futura

AREA SERVIZI
PER LA RICERCA



Contacts

Website: <https://phd.diegm.uniud.it/ees-phd/>

Coordinator: Cristian Marchioli - marchioli@uniud.it