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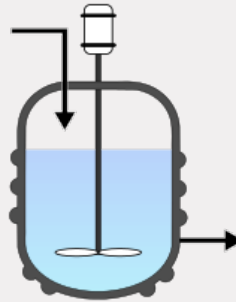
## Process intensification for the future bio-refinery: Going beyond the stirred tank reactor

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# Our Vision: Transition to biomass is **urgent & challenging...**

- Biorefinery: combination of novel biological, **catalytic & separation technologies**
- Product **degradation**: fouling, unstable operation & inefficient use of biomass



Stuck to the (not that efficient)  
stirred tank reactor...

Difficult processing

- Shift to decentralized **highly efficient & compact** production

New feedstocks, new technologies

## Design novel reactors for biorefinery

### High- shear high-gravity equipment

- Extremely compact equipment (ca. 100 smaller)
- Extremely fast heating/cooling
- Minimal product degradation
- Safe operation at extreme conditions
- Excellent for modular production
- Supreme efficiency @ lowest costs



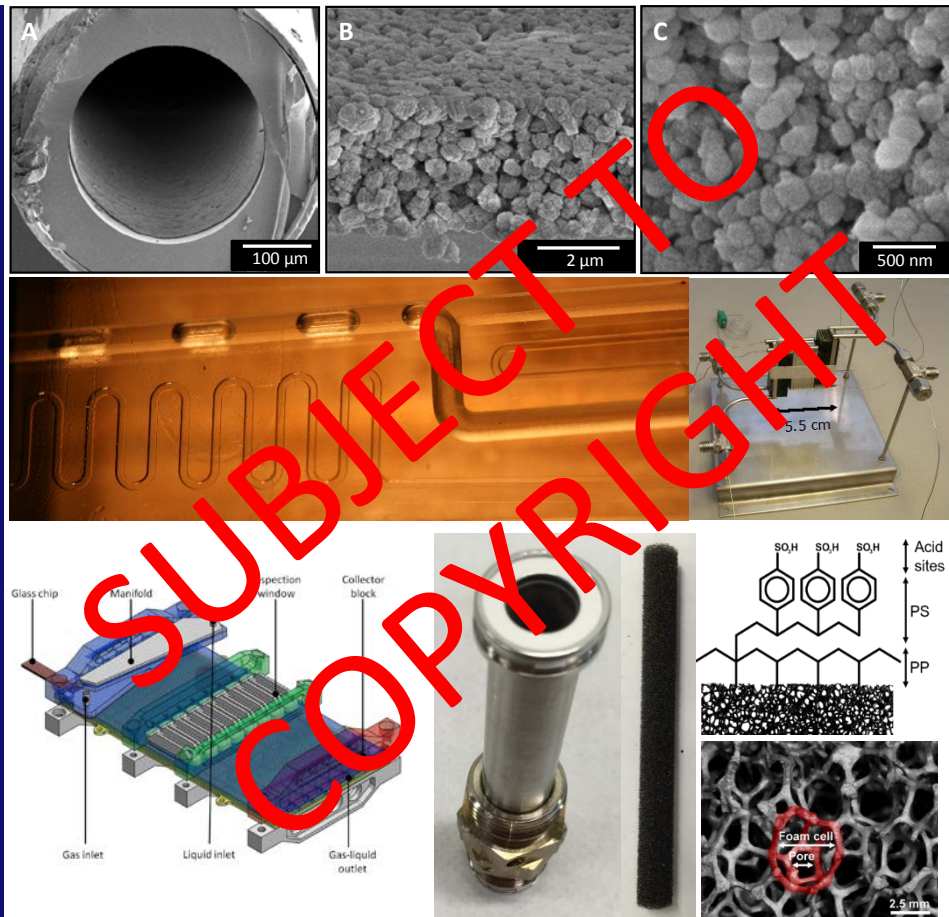


# What do we do?

## Design novel reactors for biorefinery

### Catalytic (micro)structured reactor

- Couple reactor efficiency with optimal catalytic activity
- Extremely compact equipment
- Extremely fast heating/cooling
- Minimal product degradation
- Safe operation under extreme conditions



# How exactly?

## Multiscale approach

- Experiments & first-principle modeling
- Demonstration @ lab & pilot scale
- Process Engineering (PDEng program)
- Results? Example:

Furfural production unit with nearly 100% yield in 3 min & no fouling! (reference: ca. 70%, 3-4 h, fouling)



# Interested?

*Process Intensification for the  
future biorefinery:*

*Going beyond the stirred tank  
reactor*

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