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Coach	**Supervisor(s)**	**Funding**
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Low-Temperature Aqueous Phase Production of Sustainable Aviation Fuels from Biomass

Aim

Develop efficient bifunctional heterogeneous catalysts to convert biomass-derived aldehydes to long-chain alcohols.

Justification

The aviation sector contributes 14% of the CO_2 emissions associated with transport in Europe, yet, it will continue to rely on energy-dense liquid fuels for the foreseeable future. It is hence imperative to develop sustainable alternatives. In this project, we develop a low-temperature aqueous phase catalytic route to convert biomass-derived aldehydes to long-chain alcohols that can be used as sustainable aviation fuels. (Figure) Process-modelling has shown that this low-temperature route and the inherent separation of the fuel precursor from the aqueous phase offer significant benefits over alternative high temperature routes.

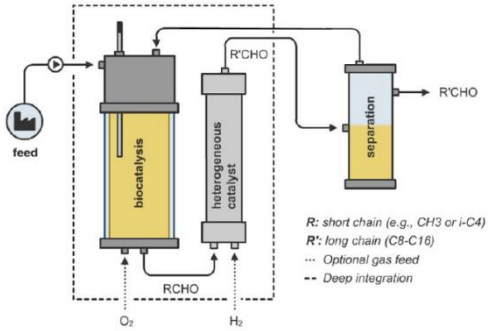
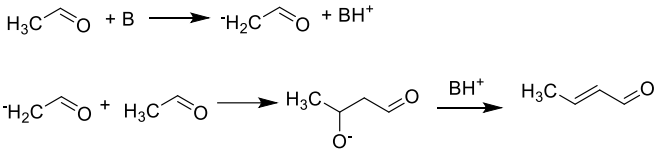


Figure: Tandem process for the conversion of biomass to liquid sustainable aviation fuels.

In this project, we will develop and test bifunctional heterogeneous catalysts which combine a metal active site with acid or base sites. The oligomerization reaction proceeds via an acid or base catalysed condensation step:



The stability of the conjugated double bond in the crotonaldehyde product likely prevents further condensation to C6 aldehydes. To continue the condensation to long-chain products, the olefin double might need to be selectively hydrogenated over a metal function. Several types of catalysts will be synthesized and tested using model reactants in an efficient small-scale batch reactor.

Program

1. Literature study on the state-of-art of thermocatalytic aldol condensation to long-chain alcohols
2. Lab-scale synthesis and testing of various potential catalysts in an efficient small-scale batch reactor.