From Syngas to Alcohol E-fuels –Scale up from lab to miniplant

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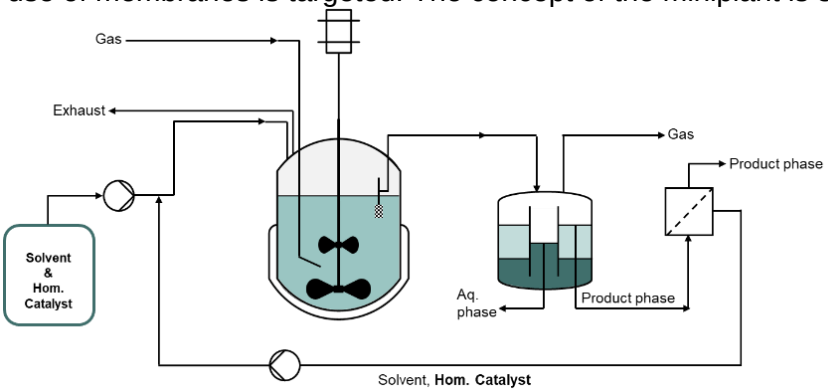
The European Green Deal aims for a climate-neutral economy by reducing greenhouse gas emissions to zero[1]. As transport is a major emitter, replacing fossil fuels in this sector is crucial[2]. While electrification suits private vehicles, alternatives like e-fuels are needed for heavy transport and shipping. E-fuels, made from renewable electricity and resources, are CO_2-neutral and compatible with existing combustion engines[3].
The EU project E-TANDEM aims to realise an efficient and direct production of a new, higher oxygenate, diesel-like e-fuel for marine and heavy-duty transport. This involves the use of CO_2 as the only carbon source and renewable electricity as the only energy. The fuel is produced in a hybrid catalytic process, starting with the high pressure electrocatalytic syngas production from CO_2 and water, coupled with a tandem catalytic e-syngas conversion. The presented work focusses on this second step, the tandem reaction in which the olefin-selective Fischer-Tropsch reaction is coupled with the olefin-reducing hydroformylation to produce long-chain alcohols from the produced e-syngas. These alcohols can either be used directly as fuel or further processed.[4] After proving the tandem reaction works in batch mode, the new e-fuel concept will now be tested in a continuous operation in a miniplant as a step toward industrial application[5]. A key aspect is the recycling of the homogenous catalyst. Due to the high energy efficiency, the use of membranes is targeted. The concept of the miniplant is shown below.



Literature:
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