

## Intensification of Aqueous Biphasic Hydroformylation of Unsaturated Oleochemicals by a Jet-loop Reactor

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### Abstract

Hydroformylation is one of the world's largest applications in multiphase homogeneous catalysis in the chemical industry and is therefore an interesting field of investigation. Of particular interest is the hydroformylation of bio-derived long-chain olefins. Due to difficult catalyst separation in single-phase operation and potential mass transport limitations in two-phase operation, huge potentials for process improvement exist. The reactions carried out here are based on the renewable raw materials methyl 10-undecenoate (Figure 1) and methyl oleate (Figure 2), which are converted *via* hydroformylation in a solvent mixture consisting of butanol/water and isopropanol/water, respectively. As seen in earlier experiments, a large amount of mediating solvents and low substrate loading were necessary to yield the desired aldehydes.

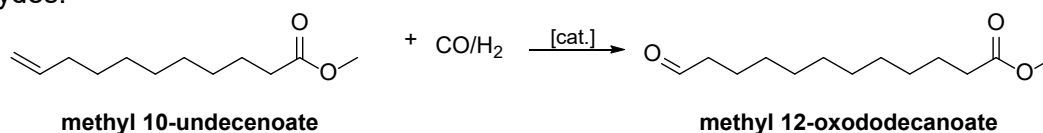


Figure 1: Hydroformylation of methyl 10-undecenoate in aqueous butanol water system.

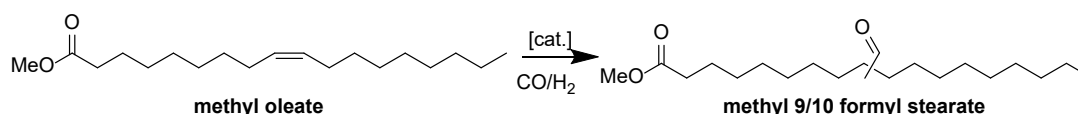


Figure 2: Hydroformylation of methyl oleate in aqueous isopropanol water system.

A promising tool for the intensification of those multiphase reactions is the jet-loop reactor (Figure 3), which enables the creation of large interfaces and therefore, improves mass transfer. In this contribution, a comparison between a stirred pressure autoclave (STR) and a jet-loop reactor (JLR) is presented. Herein, clear trends for decreasing the mediation solvent as well as for increasing substrate loading in the STR and JLR will be discussed.

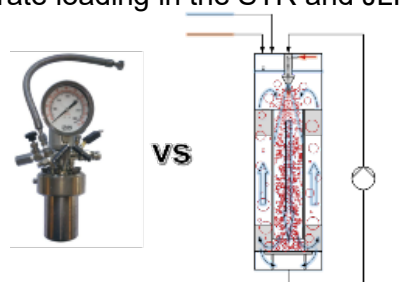


Figure 3: comparison between pressure autoclave reactor and jet-loop reactor.

[1] M. Wiedemann, S. John, D. Kutschera, F.-X. Riener, W. Döring, S. Neumann, J. Eisenlauer, M. Schlüter, *Chem. Ing. Tech.*, **2010**, 82 (3), 243-250.