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The application of an electrochemical microflow reactor for the electrosynthetic aldol reaction of acetone to diacetone alcohol

Danny Pauwels^a, Bart Geboes^a, Jonas Hereijgers^a, Daniel Choukroun^a, Karolien De Wael^b, Tom Breugelmans^{a*}

^aUniversity of Antwerp, Research Group Advanced Reactor Technology, Universiteitsplein 1, 2610 Wilrijk, Belgium.

^bUniversity of Antwerp, Research Group Antwerp X-ray analysis, Electrochemistry and Speciation, Groenenborgerlaan 171, 2020 Antwerp, Belgium.

*Corresponding Author: tom.breugelmans@uantwerpen.be

Highlights

- A modular micro-fluidic electrochemical reactor setup is constructed and employed.
- An electro-organic synthesis with the solvent as reactant is performed.
- The effect of channel design and velocity profile on the mass transfer is described.
- The laminar flow is exploited to separate highly reactive electrogenerated species.

Abstract

The design and application of an electrochemical micro-flow reactor for the aldol reaction of acetone to diacetone alcohol (DAA) is reported. The modular reactor could be readily disassembled and reassembled to change the electrodes, incorporate a membrane and remove possible obstructions. The productivity and efficiency was quantified. Using a platinum deposit as electrocatalyst or an inert glassy carbon electrode as working electrode, the maximum obtainable equilibrium concentration of ± 15 m% was reached after a single pass up to a flow rate of 8 ml min^{-1} , yielding 0.57 g min^{-1} DAA ($3.46 \text{ mmol cm}^{-3} \text{ min}^{-1}$) at an efficiency of 0.33 g C^{-1} on platinum and 0.50 g min^{-1} ($3.04 \text{ mmol cm}^{-3} \text{ min}^{-1}$) at 1.20 g C^{-1} on glassy carbon. Note that no optimisation studies have been made in the present paper.

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