



MICRO-ELECTROBIOLOGICAL SYSTEM

Impedance Spectroscopy for Micro-Reactors

Project Summary

A laboratory prototype of a micro-reactor with integrated electrochemical sensing electrodes was realized, together with the associated excitation, lock-in amplifier and frequency response analysis. Resistivity and permittivity as a function of frequency are recorded.

Standard PCB technology was used for the electrodes. The reactor is molded in PDMS. The electrodes can also be insulated in PDMS. Given the low cost realization of reactor and electrodes, a one-time use is possible.

The micro-reactor is a continuously operating channel, with an inputs mixing chamber. The electrodes are located in specially designed chambers with flow obstacles.

Valorisation

Several aspects of this work are original and go beyond of what was published in this field previously:

- ◆ The combination of impedance spectroscopy with a miniature flow-through reactor.
- ◆ The miniaturization of electrodes allowing monitoring of several points inside the micro-reactor.
- ◆ The use of low-cost manufacturing technology for the electrodes, in view of disposable reactor systems.
- ◆ The use of fully digital lock-in amplification for impedance spectroscopy.

This project allowed to make an important step forward between a first demonstration of feasibility with a large size bioreactor, on the one hand, and a disposable instrumented micro-reactor product, on the other hand. The laboratory prototype is an indispensable prerequisite and reference for investigating the frequency response properties of different reactions.

Further developments that are initiated starting from this project, include:

- ◆ Extending the sensing concept to an array of batch reactors, e.g. wells of a micro-titer plate.
- ◆ Defining requirements for a potential commercial product.

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