



MICRO-FERMENTATION SYSTEM

Impedance Spectroscopy for Disposable Arrays of Micro-Reactors

Project Summary

A laboratory prototype of a disposable low-cost micro-reactor with integrated electrochemical sensing electrodes was realized, together with the associated excitation, lock-in amplifier and frequency response analysis. The recorded frequency response of impedance can be translated into. Standard PCB technology was used for the electrodes, with medical grade silicone coating. The reactor is a modified Erlenmeyer flask. Given the low cost realization of reactor and electrodes, a one-time use is possible. 8 falsks can be multiplexed using large signal bandwidth relay commutation, allowing parallel culture monitoring.

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 commercial Erlenmeyer flask, where currently no on-line monitoring is feasible.
- The use of low-cost manufacturing technology for the electrodes, in view of a disposable reactor systems.
- The use of fully digital lock-in amplification for impedance spectroscopy and adapted relay multiplexing circuit for parallel culture monitoring.

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 reactor product, typically for process up-scaling, on the other hand. The laboratory prototype is an indispensable prerequisite and reference for investigating the frequency response properties of different reactions. Patent protection of the developed system is being sought, and contacts with potential users and manufacturers of Erlenmeyer flasks with impedance spectroscopy are under way.

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This project has been carried out by HES-SO Valais-Wallis in collaboration with hepia