Clone of the integrated downstream process of biopharmaceuticals on a microfluidic platform

Proposers

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Introduction

Continuous manufacturing in bio-industry has been recognized as the biggest opportunity for further optimization of production of biopharmaceuticals, which will consequently drastically decrease the production costs and enable accessibility of biologics to much wider human population, including third world countries. Particularly, continuous downstream processing has not been implemented in bio-industry yet, since it represents a completely new approach to product recovery. The significant reduction of process footprint by scale-down of operation units would allow the manufacturing process to be performed in a small space, such as container, that can be mobilized to any world-wide location. Miniaturization and scale-down of unit operations and process design and development of integrated continuous downstream processes, based on microfluidic devices, will be the basis for setting up the fundamentals of continuous downstream processing of biologics.

The overall goal of this project is to develop experimental clone of the integrated downstream process of biopharmaceuticals on microfluidics` basis.

Partner 1 Speciality

The group at iBB has a vast experience in the downstream processing of biopharmaceuticals, namely in the purification of antibodies, using different methodologies, namely liquid-liquid extraction using aqueous two-phase systems (ATPS), precipitation, membranes and chromatography.

Partner 2 Specialty

The INESC-MN team has extensive experience using soft lithography technology for microfluidic structures and has successfully integrated this technology with biosensing devices.

Project outline/goal

This project aims to develop a miniaturized continuous bioprocess for purification of biopharmaceuticals, for fasten bioprocess development, with potential for scale-up and scale-out pilot line production. The microfluidic chip (MC) platform to be developed is envisaged to integrate down stream process (DSP) sequence, including aqueous two-phase systems, precipitation, chromatography polishing step and concentration and buffer exchange steps, cloning the integrated developed DSP at larger scales. The different MC designed and developed (ATPS, precipitation, chromatography and tangential flow filtration) will be tested for each operation units and will be combined in one end-to-end integrated continuous chip for the purification of antibodies from clarified cell culture streams. The results obtained with the different prototypes will be validated at laboratory scale, in terms of yield, concentration and product quality.

Student profile

Profile sought: preference, but not limited, to students with a background in Biological Engineering and Biotechnology with an interest in combining production and downstream of biologicals with microfluidics.