3D Printing Separation device

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SYNOPSIS / KEY THEMES

- **This project aims at creating a 3D printing device that is reliable, strong and implicit to the separation of generic protein solution .**
- **Project Objectives:**

1. Designing the 3D printing Device
2. **Modelling the hydrodynamic of the Device using COMSOL-Multi-physics®, and /or ANSYS Fluent**
3. CAD model of the 3D printing Device
4. Experiment to Separate protein solution

Surface Excess

Surface excess is the difference between the amount of a component actually present in the system, and that would be present in a reference system

$$\Gamma_i = \frac{N_i^\sigma}{A} \left[{}^{mol}/_{m^2} \right]$$

$$N_i^\sigma = \Gamma_i \times A$$

3D printing Technology

- Excellent in creating rapid prototyping
- Very quick process
- Inexpensive

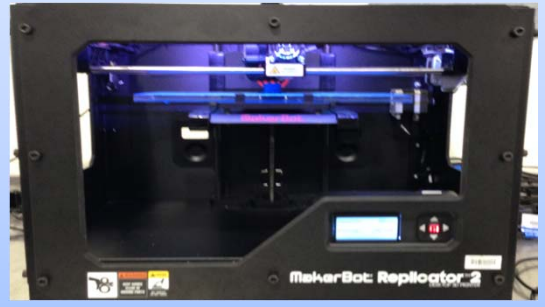

Figure1 3D Printer

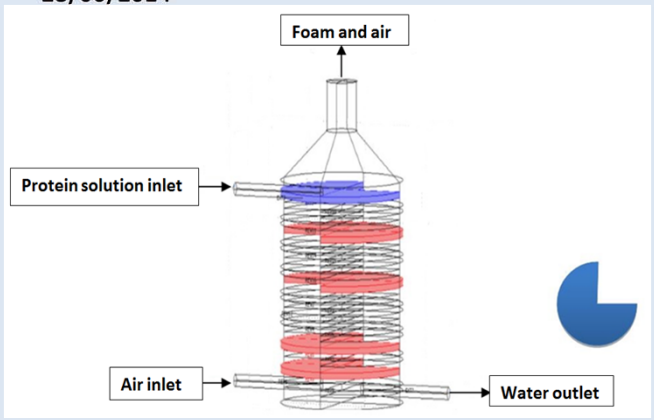

Figure2 First Design

Principles of the Design

- Distinct inlets for both fluids
- Create enough time for the air, and protein solution to interact to produce foam
- A tapping mechanism to tap off the produced
- Distinct outlets for both fluids

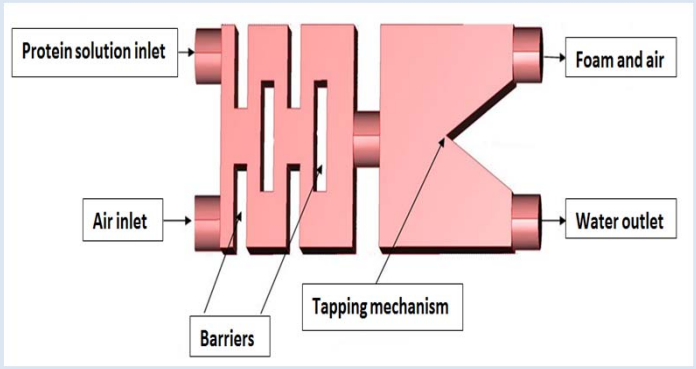

Figure3 Proposed Design

CFD SIMULATIONS

- Air , and water used in the simulation

CFD is very crucial part in the project

- Validate of the proposed design in term of the efficiency to mix, and separate both fluids into two different outlets
- It will be used to carry out several refinements in the device (rearrange the the barriers, rounding the sharp corners, adjustment of the inlets, and outlets, and rescale the dimension.

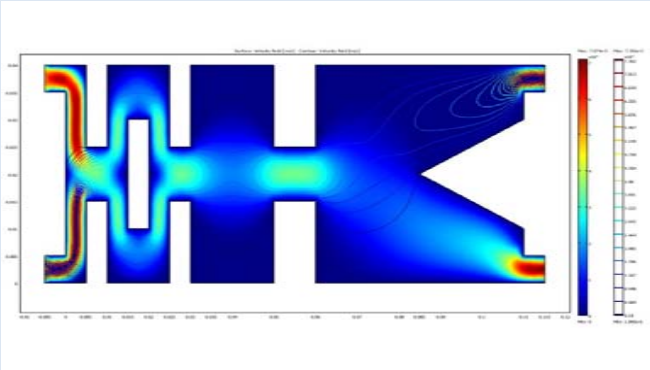

Figure4 COMSOL Simulation

Figure 5 ANSYS Simulation

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