Crystallization of High-Quality Proteins using Microfluidic Devices

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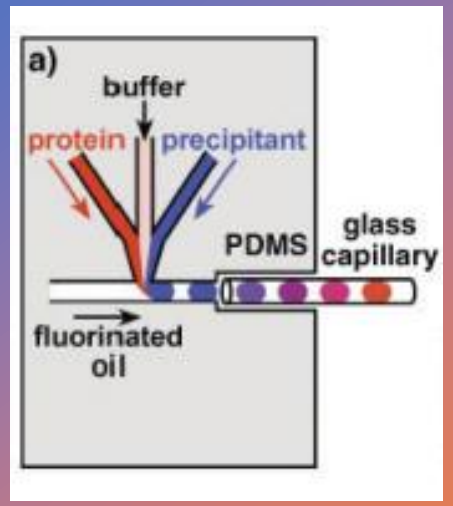
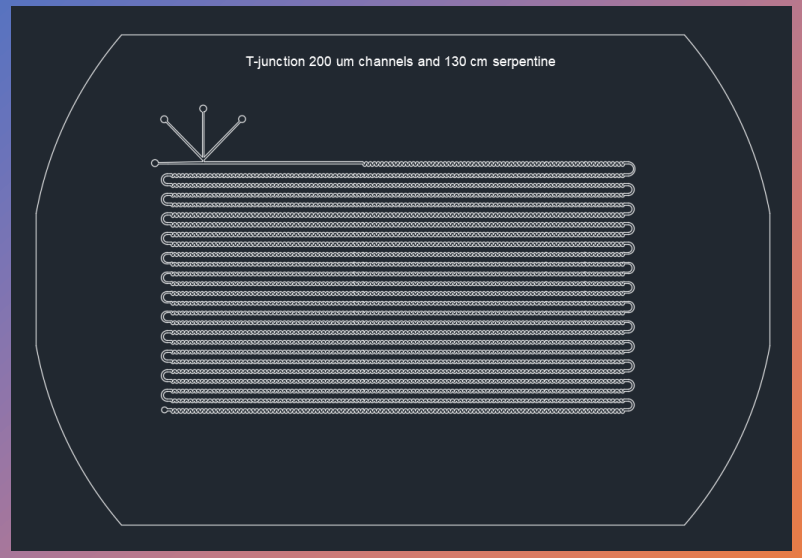
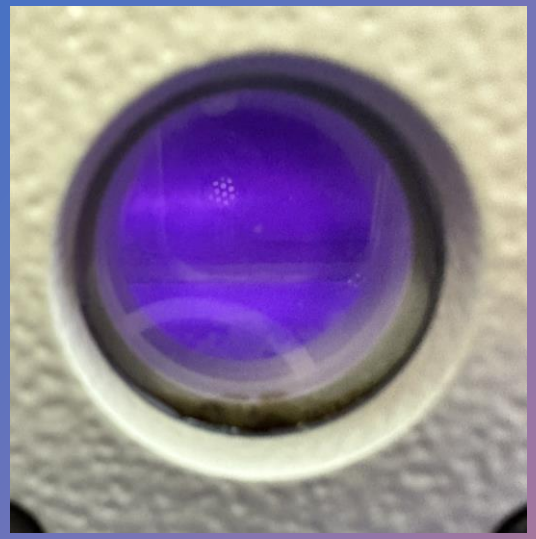
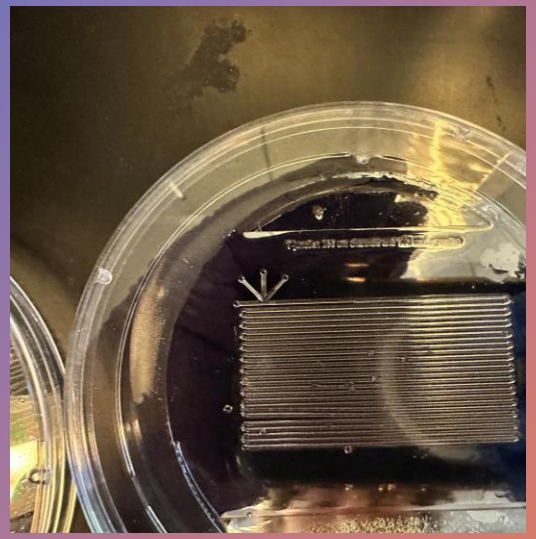


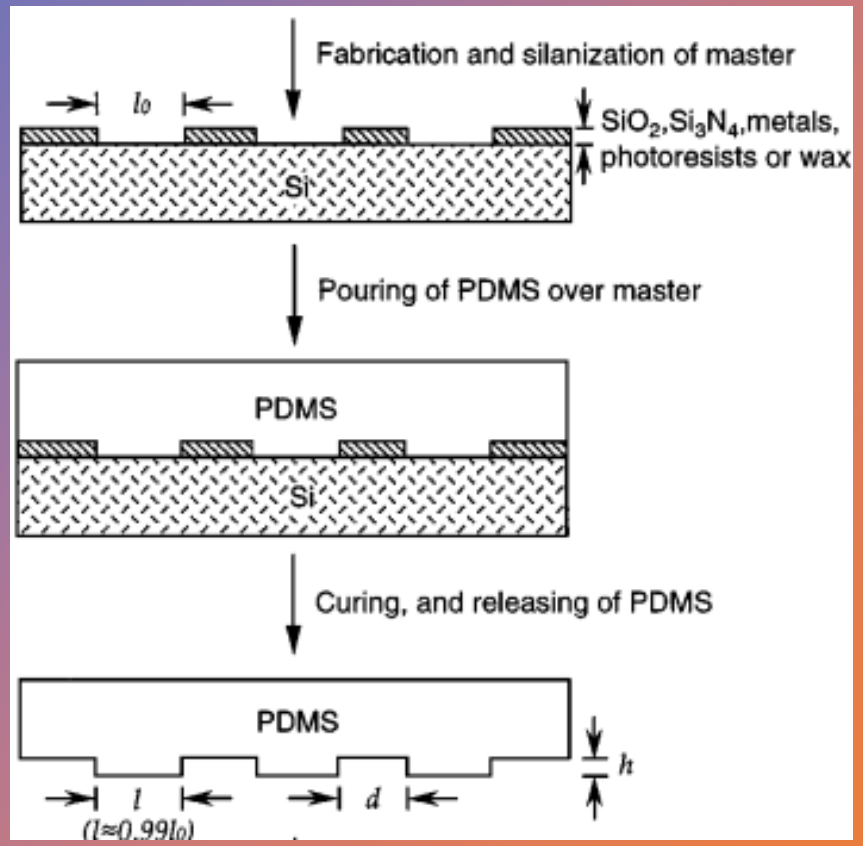


The Purpose of the Research

- The main purpose is to find the ideal mix of protein, precipitant, and buffer to have the fastest and best crystallization of the protein.
- The proteins take about a week to crystalize, which is why drops are ideal because it increases the speed of crystallization.
- The design is printed on PDMS which is then attached to glass, allowing the flow to be through the printed channels only.
- The crystals are used to identify and treat multiple diseases, and for other therapeutic purposes.
- Microfluidics are a great way to test these drugs since they are a lot smaller, so they use less materials than many other research methods.







Design and Fabrication Approaches

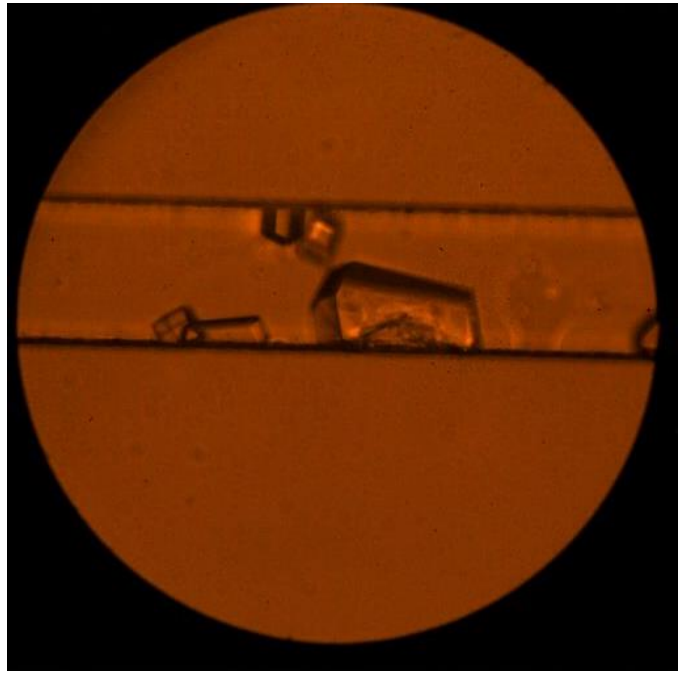
- Creating an ideal design for the mixing of the three mixtures, using knowledge of fluid mechanics to test the flow of different junctions and angles.
- The next step would be the fabrication, the masks are made by the binding of a silicon wafer to a 200-micron film. The film is exposed to UV light to print the pattern.
- The mask is then used to print the pattern onto PDMS, which is the material used to test these fluids.

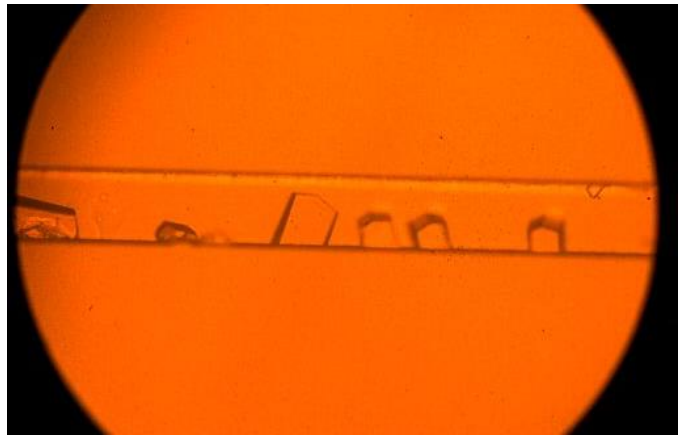
Results of the Research

The crystals generated even when the droplets burst, and the continuous phase evaporated.

The continuous phase which is HFE oil evaporated even when the inlet and outlet channels were sealed using multiple methods such as epoxy, grease and melting the inlet tubes.

The crystals seemed to be uniform, and they were generating at different heights which we observed through the focus of the microscope.





Future Directions

- Change the design to increase the number of droplets we can store.
- Use filtration before inserting solutions so we don’t encounter clogging.
- Use filtration in the microfluidic device.
- Use the results as a benchmark for the solutions’ concentrations.