



# Surfactant Removal Apparatus

Dylan McCapes and John Frostad

Department of Chemical Engineering  
University of California, Santa Barbara



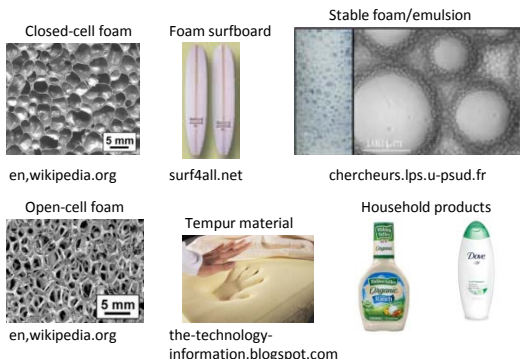
## Objective

The objective of this study is to develop an apparatus to remove surface active contaminants from a liquid-liquid interface while retaining as much of the original liquids as possible. These surfactant free liquids will then be used to conduct experiments on coalescence phenomena without the added complications of the Marangoni effect.

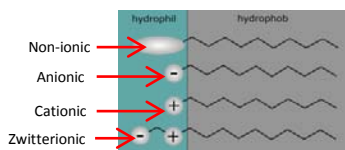
## Motivation

### Stability of Foams and Emulsions:

Surfactants play a key role in the production of stable foams and emulsions. The presence of surfactants increases drainage time and allows for foams to dry out and solidify. Surfactants also increase the drainage time for emulsions, producing emulsifications that do not return to their original phases.

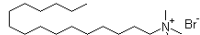


## Surface Active Agents

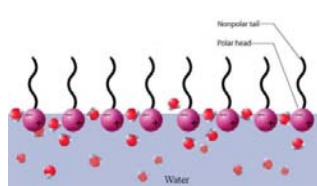


<http://en.wikipedia.org/wiki/Surfactant>

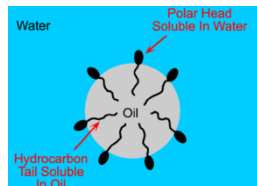
Hexadecyl Trimethyl Ammonium Bromide



<http://www.globalchems.com/structures/57-09-0.gif>



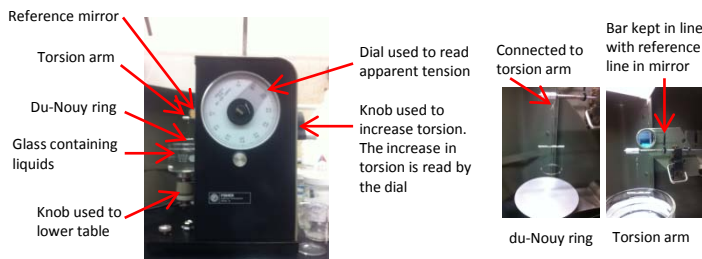
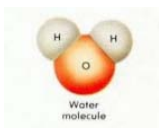
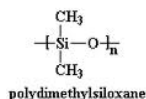
[http://en.wikipedia.org/wiki/Langmuir%E2%80%93Blodgett\\_film](http://en.wikipedia.org/wiki/Langmuir%E2%80%93Blodgett_film)



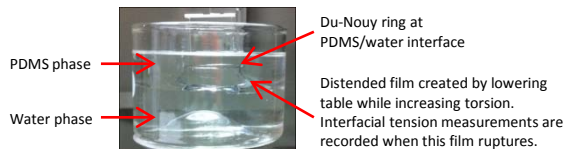
[sparror.cubecinema.com](http://sparror.cubecinema.com)

## Tensiometer Measurements

The liquid-liquid system used in this study is that of deionized water and polydimethylsiloxane, or PDMS.



Fisher Tensiometer



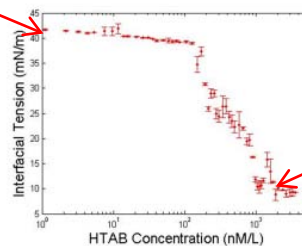
Du-Nouy ring at PDMS/water interface

Distended film created by lowering table while increasing torsion. Interfacial tension measurements are recorded when this film ruptures.

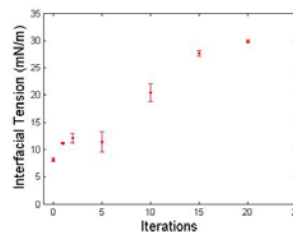
## Results

### Isotherm for HTAB in water/PDMS

"Pure" interfacial tension of water and PDMS measured to be 42.0 mN/m



Critical Micelle Concentration observed to be near 1 micro-mole



Flat Interface Removal

## Apparatus Design

### Two-Syringe design

The two-syringe design enables the experimenter to separate the two fluids



A valve system will be used to connect the two syringes, and will also serve to form emulsions, eject fluid and measure interfacial tension

Adapters to connect to syringe

Three half-spherical ball valves will be used to direct flow

Hole for pendant drop/jet stream

Ejection tube

