

Easy Release Coatings

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GOAL

- To design a non toxic easy release coating that will not allow fouling or allow only weak adhesion.
- Use of gelest and sylgard-184
- Determine the fracture and mechanical properties of the two samples.

Objectives

- Investigate release using different coatings
 - sylgard-184
 - gelest
- study the effect of thickness
 - how does the thickness of a sample affect the release mode.

Approach

- design coating with very low surface energy.
- Perform pull off test using pseudobarnacles.
- make different thickness from the samples

Background

- Release occurs by peeling.
- Two stages of peeling: crack initiation or propagation.

Coating preparation

conditions	Sylgard-184	Gelest
Substrate	Glass	Glass
Thickness(mm)	1	1
Cure Temp	85 degrees C 2hrs degrees C 1hr	75
Elastic Modulus	3.4	2

Summary of pull off

The pull of test was done on the psuedobarnacles on the romulus tester.

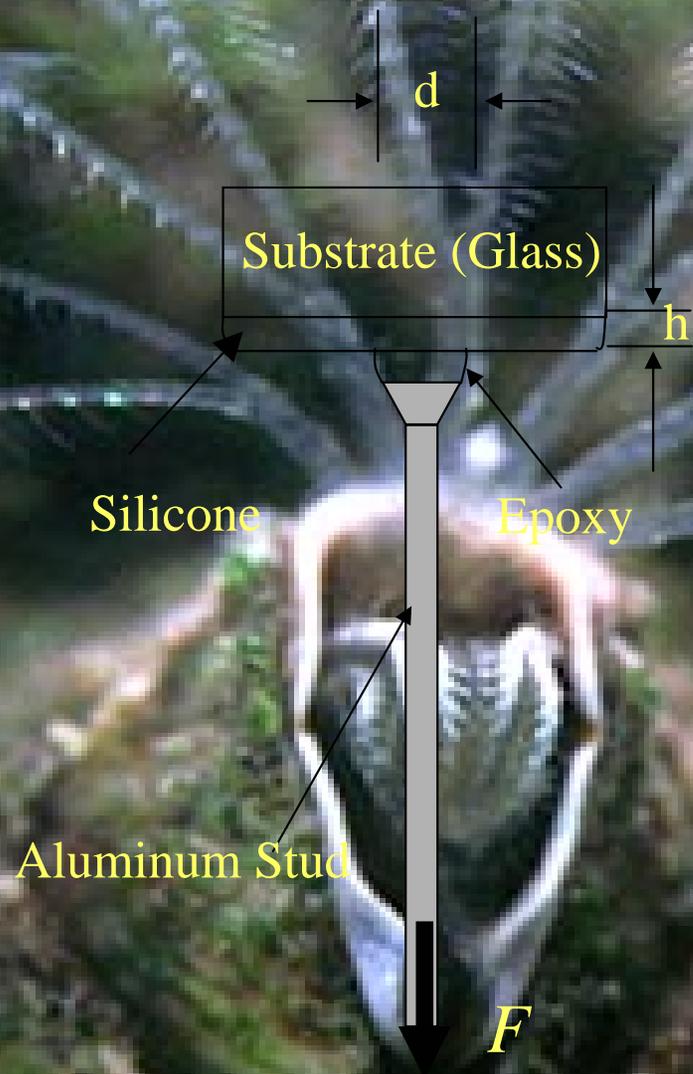
A labview software written by Jongsoo Kim was used to collect the force, displacement and time data.

A VCR was used to record the pull off activity.

A romulus machine was used to record the force data.

The delta scan was used to put two imaged on one monitor.

Pull of test on pseudobarnacle

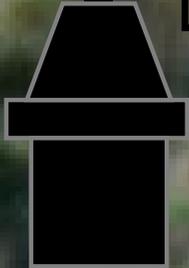


Romulus tester (Quadgroup Inc.)

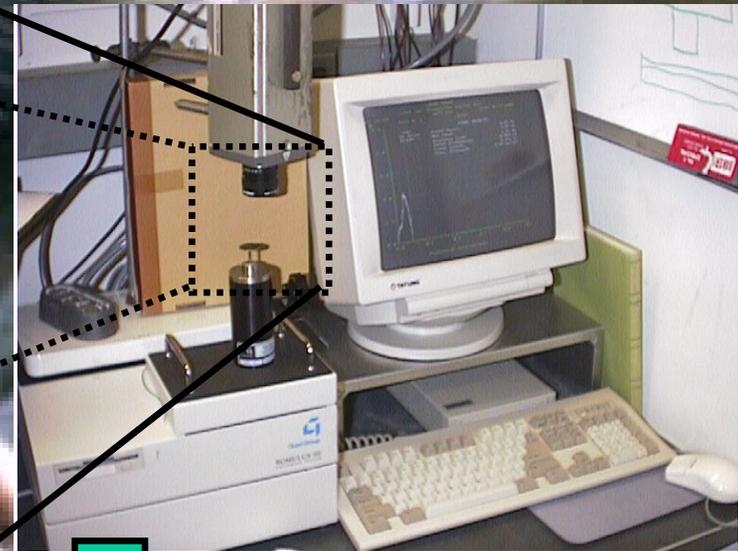
Video



ring



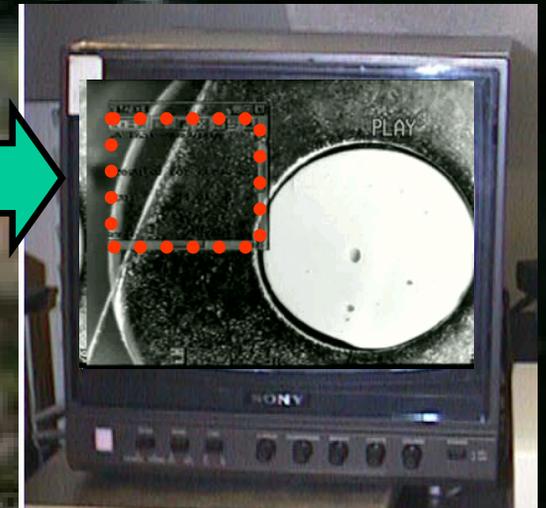
Force



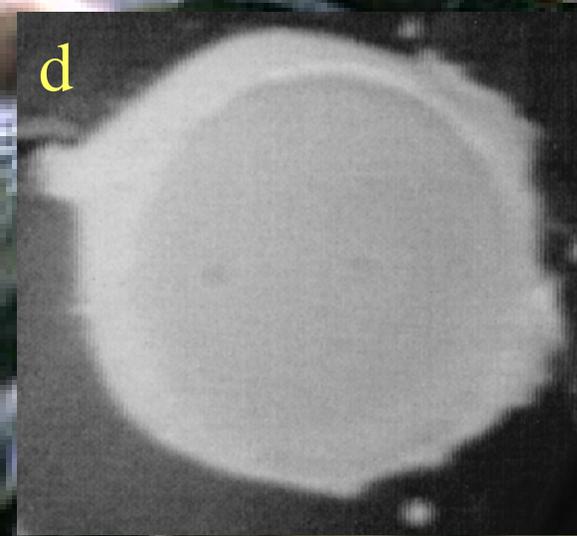
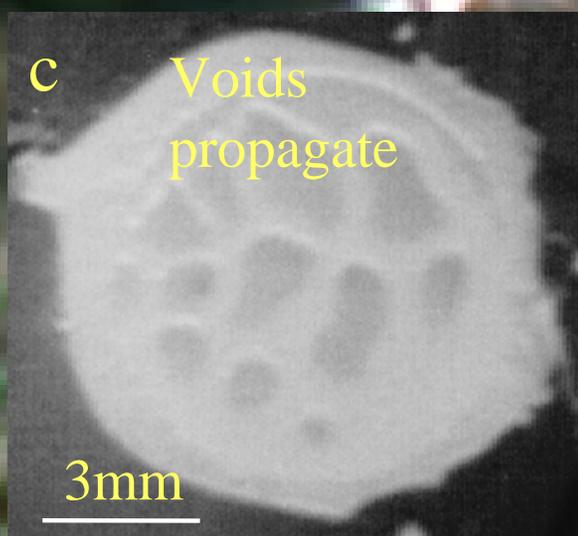
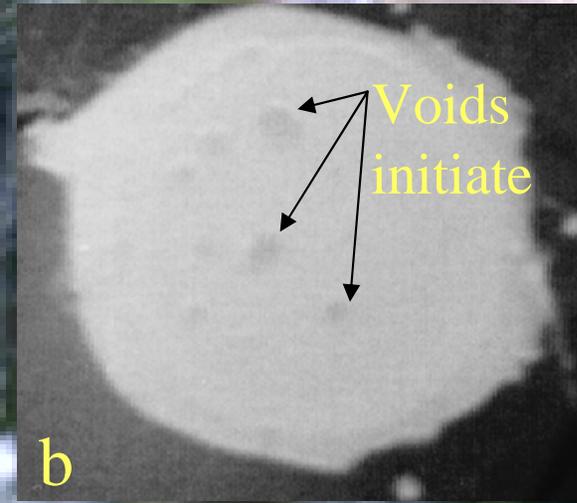
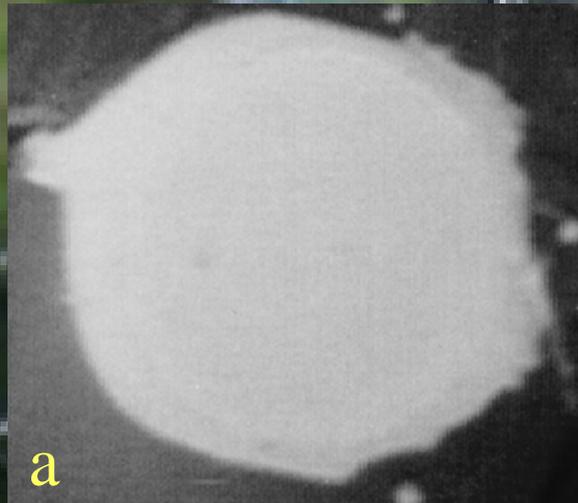
computer screen



Deltascan Pro

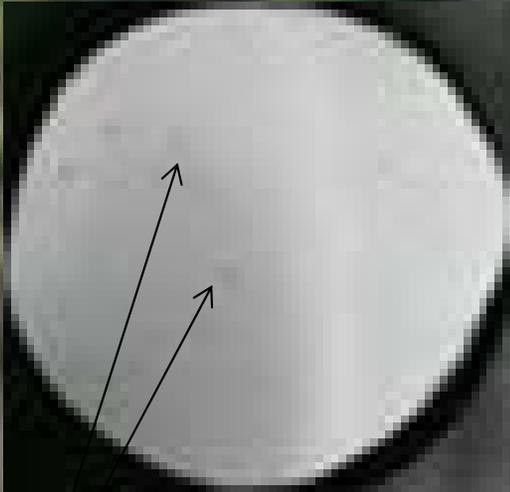


Pull-off behavior of epoxy on silicone on thin coating

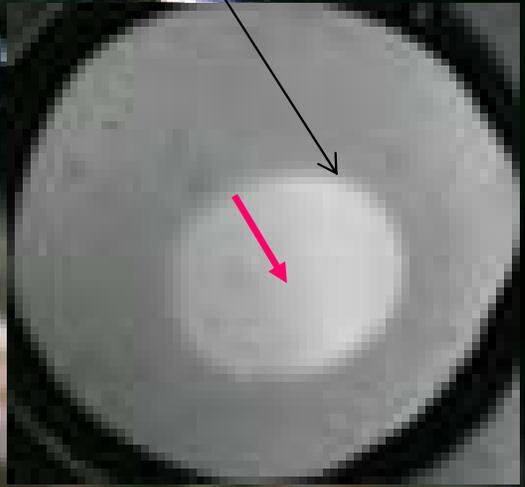
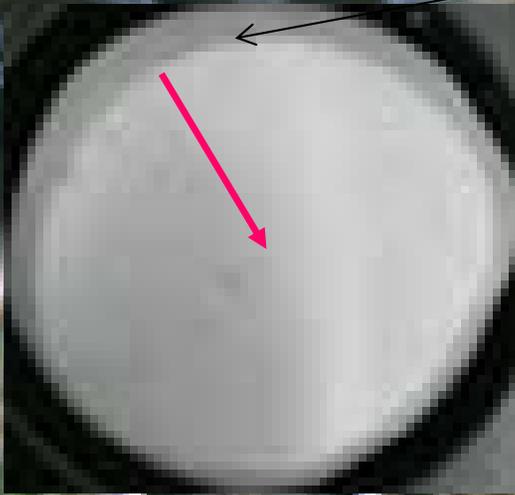


Pull-test from thick coating:

Edge peeling



Pre-existing voids



A close-up photograph of a barnacle attached to a dark, textured surface. A thin, light-colored force probe is positioned against the barnacle's shell, likely for a shear test. The background is dark and out of focus.

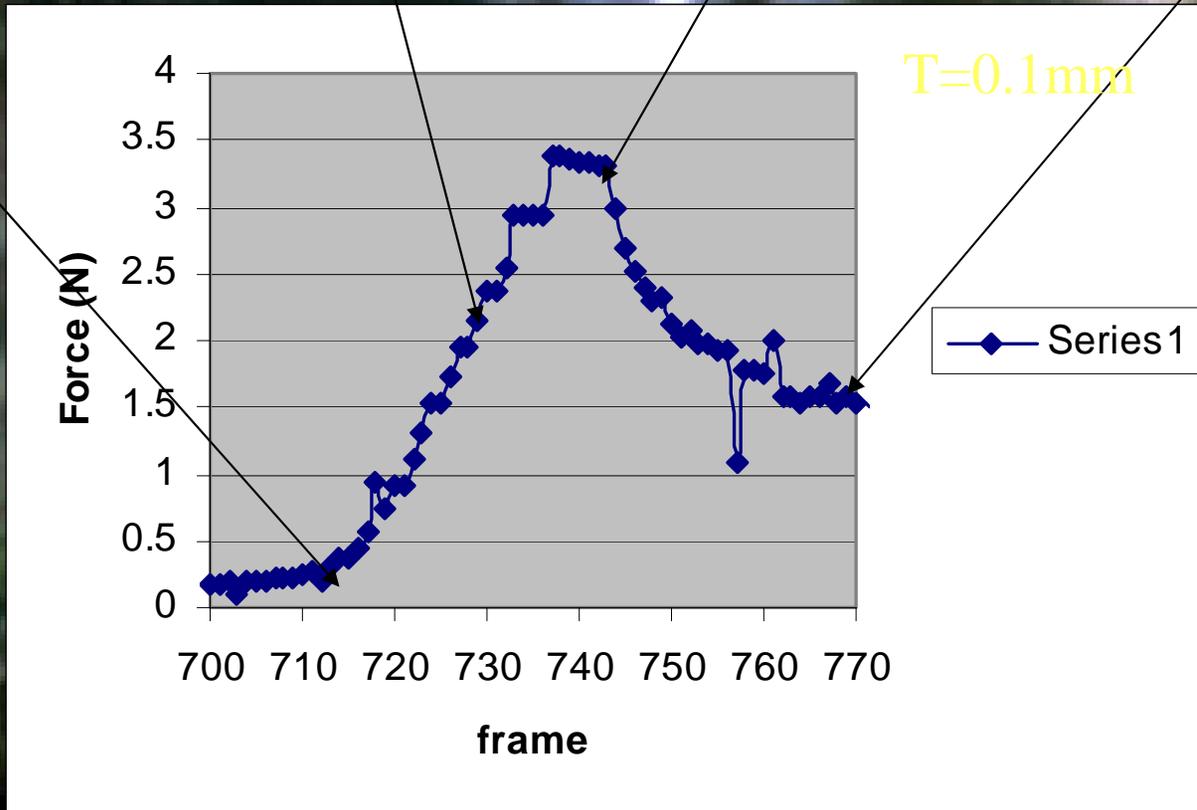
Real Barnacle Test Done by Dr. Irwin Singer and Dean Wendt in California.

Real barnacles were grown and a shear test was done.

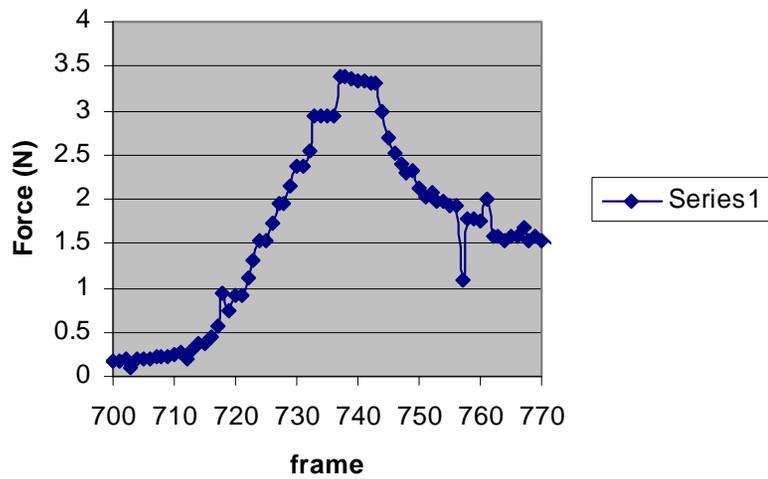
Videos were captured and then viewed at 30 frames per second force was recorded.

It was later edited in virtual Dub

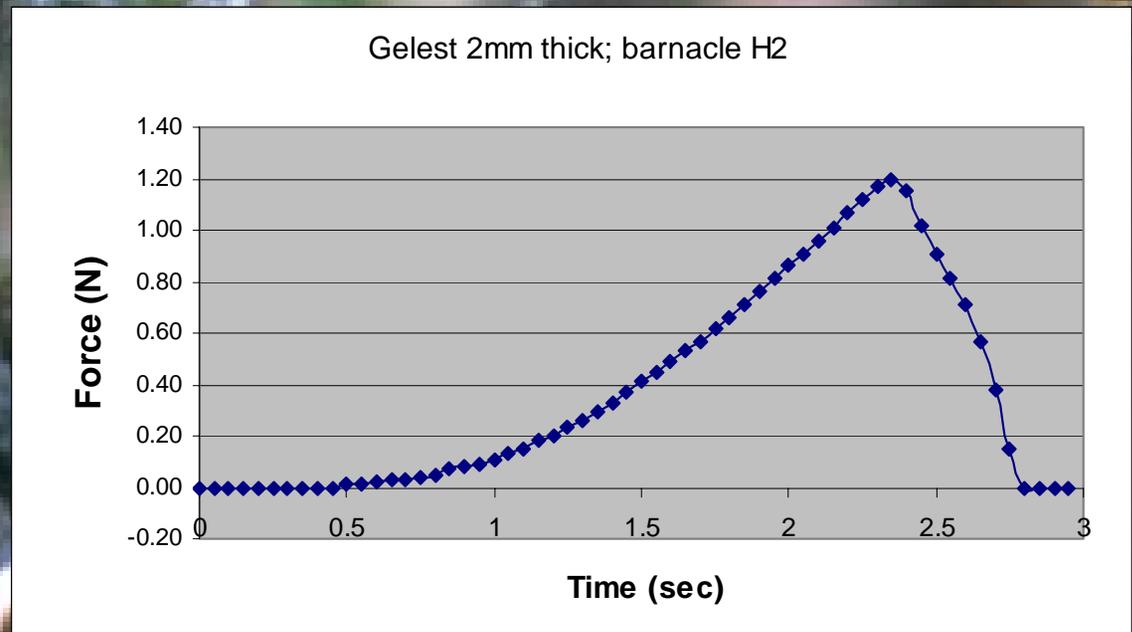
Thickness 0.1mm A2



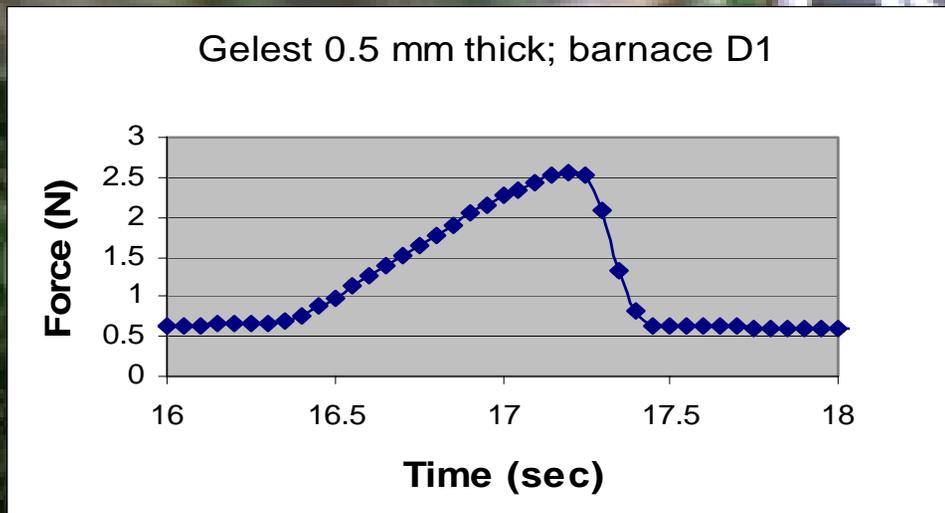
0.1mm



2mm

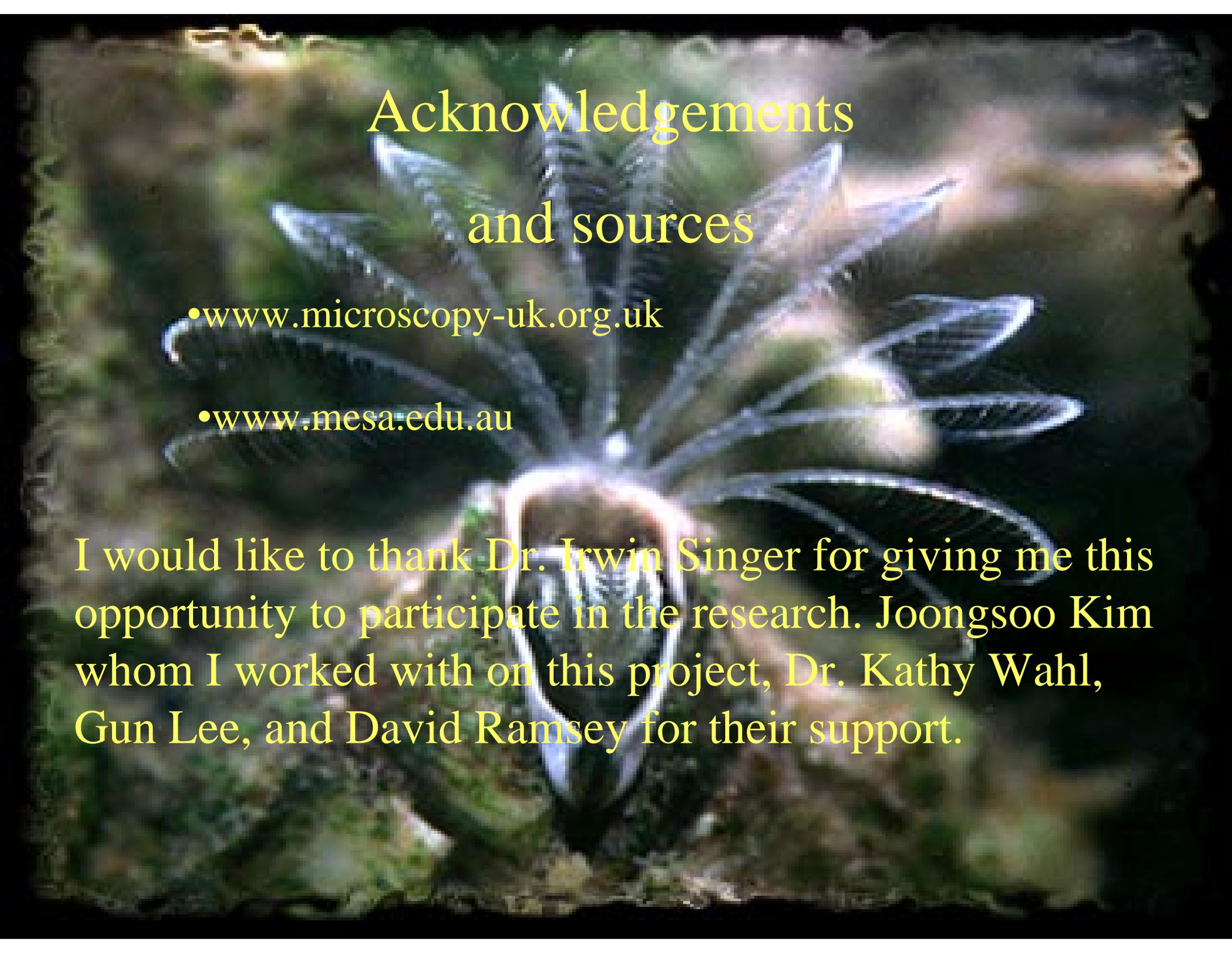


0.5mm



Conclusions

- In common even though we used different coatings their force curve looks the same has an initiation and maximum force.
- There are three things that play a major role in finding a good easy release coating, surface energy, thickness, and modulus.
- Gelest coatings needed less force to pull than sylgard-184.
- Thicker coatings pulled off at less force than thinner coatings.
- Thicker coatings peeling began on the edges and thinner coatings formed voids and peeled from the inside.



Acknowledgements and sources

- www.microscopy-uk.org.uk
- www.mesa.edu.au

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