

Photo-curing of PDMS Foams

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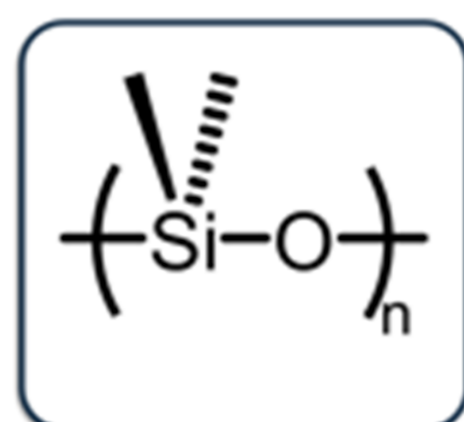
School for the Engineering of Matter, Transport, and Energy



Research Question

Is it possible to make photo-curable porous PDMS (polydimethylsiloxane) ?

Background



PDMS

- ✓ High thermal stability
- ✓ High elasticity
- ✓ Hydrophobic
- ✓ Biocompatible

- Soft material useful for Pressure Sensing
- Need for higher resolution data reading

Thermo-induced vs Photo-induced Curing Kinetics

Thermo-induced

- Begins Curing instantly
- Slow reaction
- Limits processing time

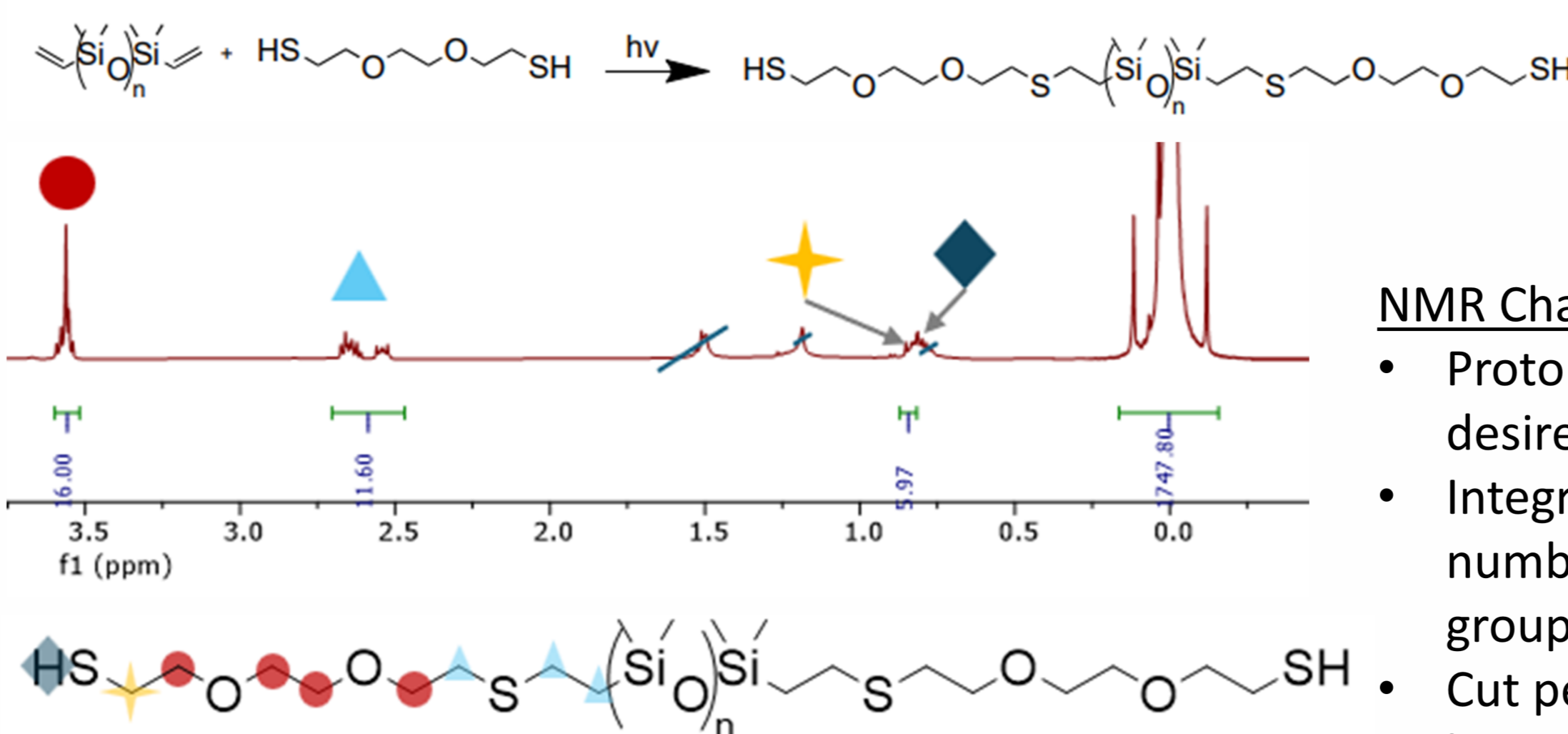
Photo-induced

- Controlled curing kinetics
- Fast reaction
- Stable resin

Photo-driven curing can allow new design applications

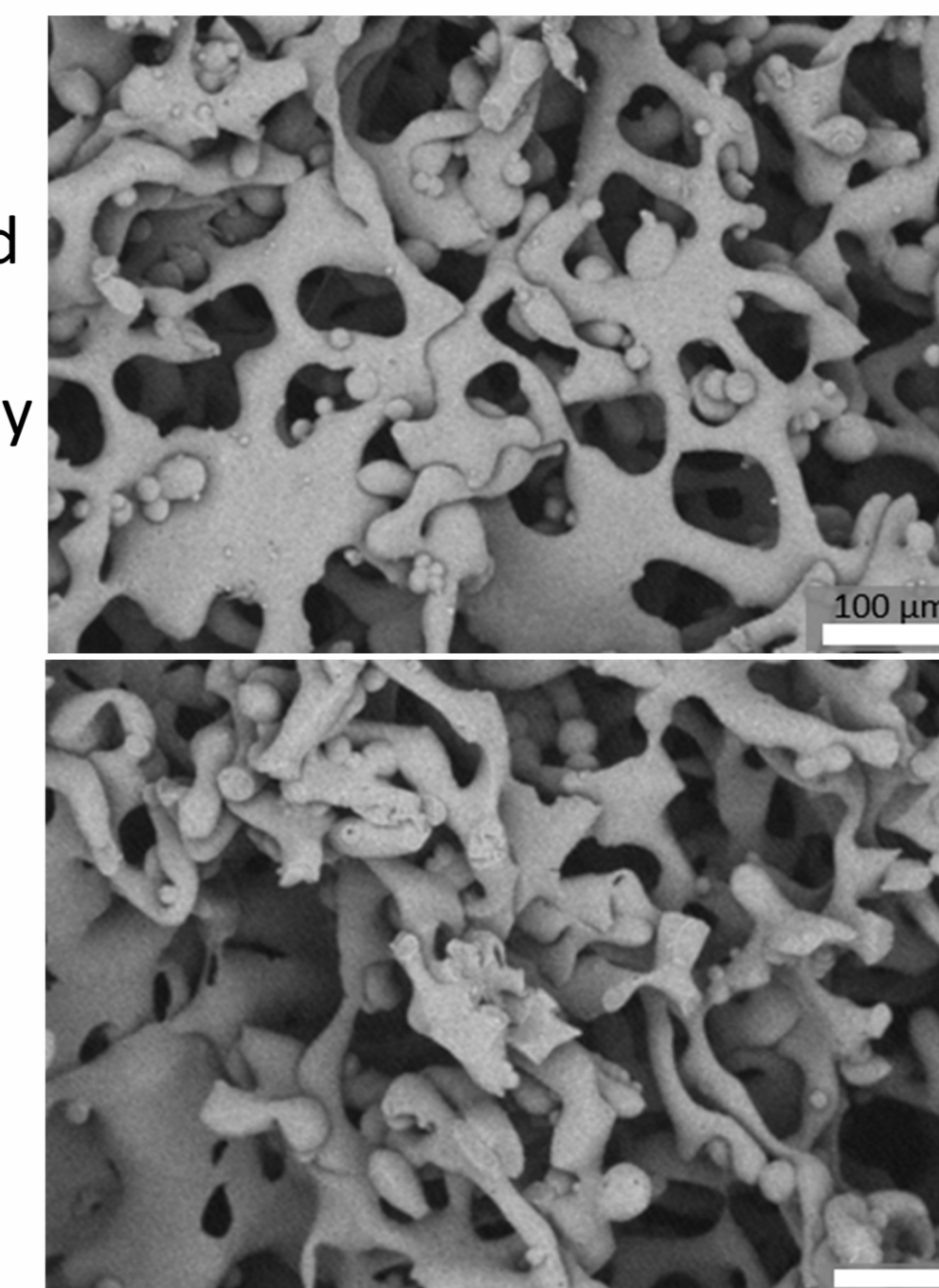
Results

Solvent: Hexane
Photo-initiator: DMPA



SEM Characterization:

- Pores are random and uniform
- Open Cell Morphology
- Freeze-casted with cyclohexane porogen



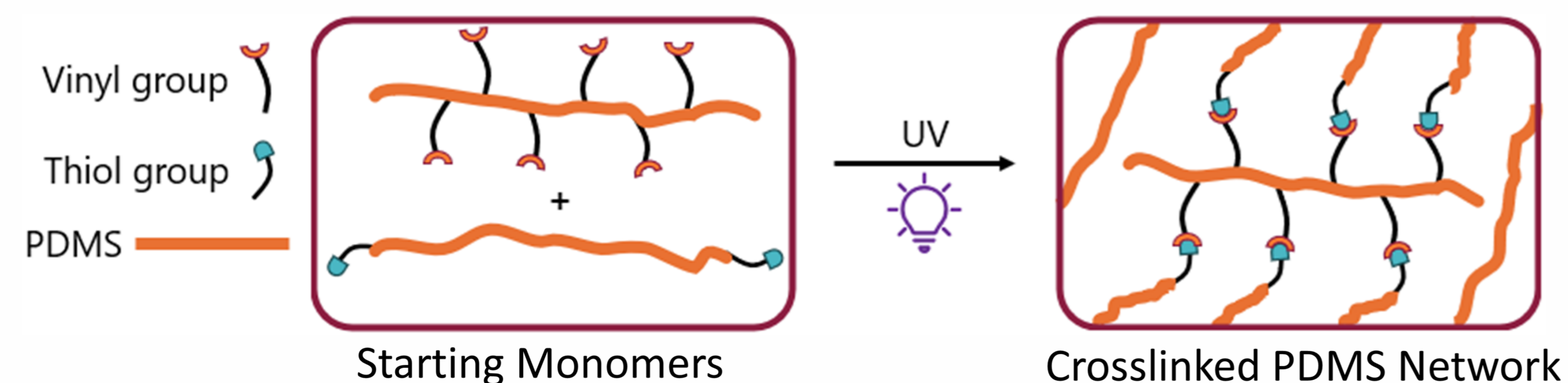
NMR Characterization:

- Proton NMR signals indicate desired product
- Integrations show correct number of protons for each group
- Cut peaks consist of water and hexane

Methods

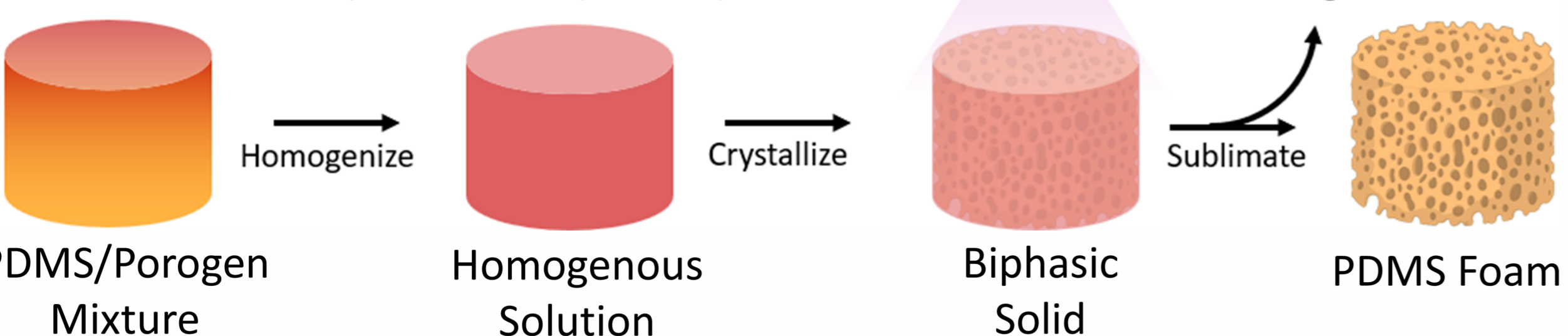
Thiol-ene Chemistry:

- Synthesis of thiol terminated PDMS to crosslink network



Freeze-casting:

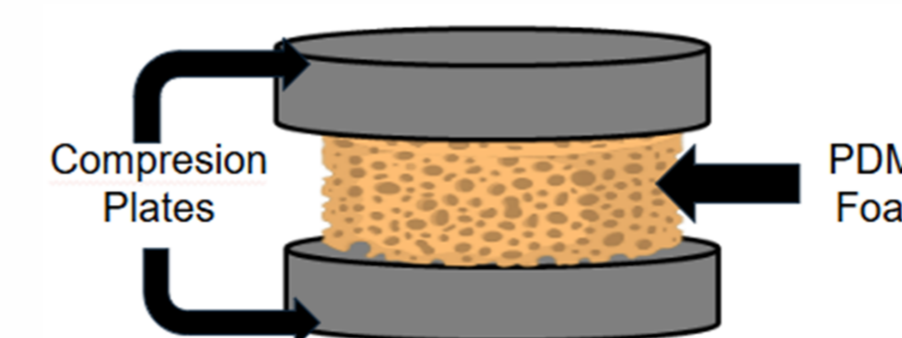
- Porosity is controlled by porogen load
- Softness is dependent on porosity



Future

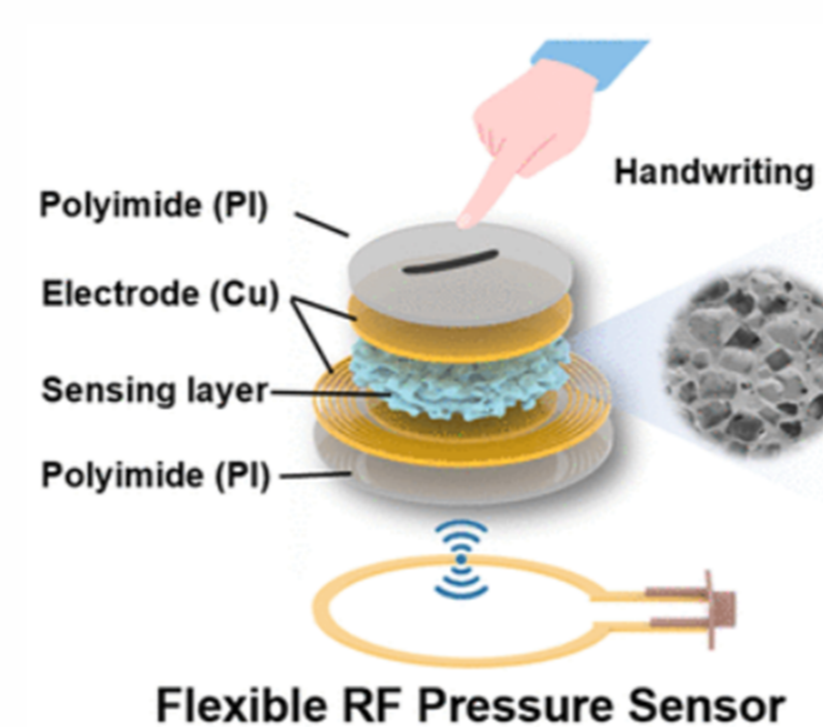
Research/Applications

Research: Compression Tests



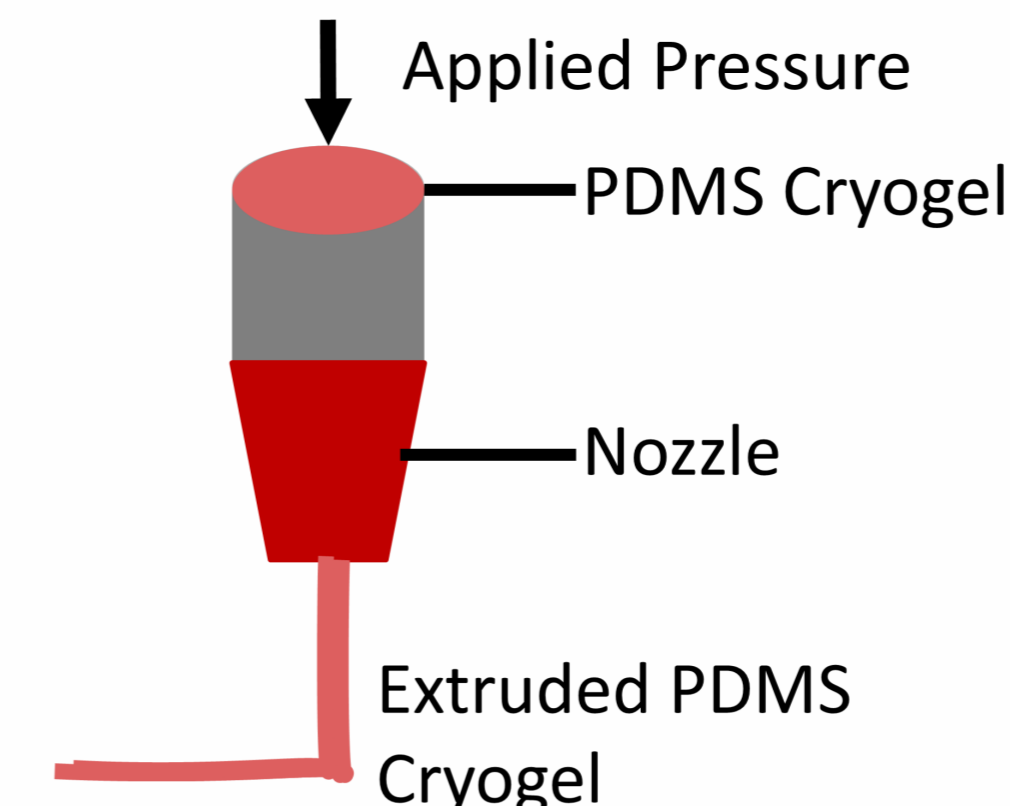
This testing will give data on the capabilities of this product's pressure sensing capabilities

Applications: Wearable Pressure Sensing and 3D-Printing



Yang et al., *Appl. Polym. Mater.*, 2021.

Direct Ink Write:



Conclusion

- ✓ Thiol terminated monomer
- ✓ Controlled Porosity
- ✓ Photo-Driven Curing Kinetics

Synthesis Complete, Next Steps Towards Applicative Testing



Acknowledgements

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