

Pittsburg State University

Pittsburg State University Digital Commons

Paper and Posters Presentations

2017 Research Colloquium

4-2017

High-quality Polyurethane Foams and Sheets from Sustainable Natural Resources

Sanket Bhoyate

Pittsburg State University

Chungyang Zhang

Pittsburg State University

Mihail Ionescu

Pittsburg State University

Follow this and additional works at: https://digitalcommons.pittstate.edu/papers_2017

 Part of the [Polymer Chemistry Commons](#)

Recommended Citation

Bhoyate, Sanket; Zhang, Chungyang; and Ionescu, Mihail, "High-quality Polyurethane Foams and Sheets from Sustainable Natural Resources" (2017). *Paper and Posters Presentations*. 6.
https://digitalcommons.pittstate.edu/papers_2017/6

This Presentation is brought to you for free and open access by the 2017 Research Colloquium at Pittsburg State University Digital Commons. It has been accepted for inclusion in Paper and Posters Presentations by an authorized administrator of Pittsburg State University Digital Commons. For more information, please contact digitalcommons@pittstate.edu.

High-quality Polyurethane Foams and Sheets from Sustainable Natural Resources

Sanket Bhoyate, C. Zhang, M. Ionescu, P. K. Kahol, Ram K. Gupta

Topics

- ▶ Introduction
- ▶ Experimental details
- ▶ Characterization of polyols
- ▶ Foaming process
- ▶ Properties of foams
- ▶ Casting process
- ▶ Properties of casts
- ▶ Applications for casts and foams
- ▶ Summary and future work
- ▶ References

Introduction

Sustainable natural resources

- ▶ They are renewable and can be easily reproduced



Non sustainable natural resources

- ▶ They are non renewable and requires long period of time to be reproduced.

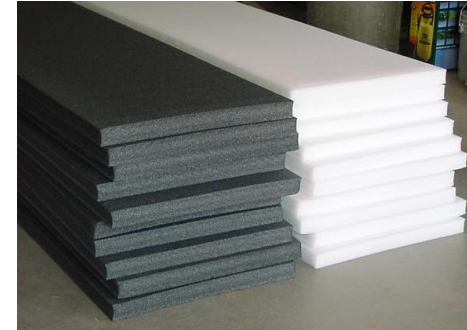


Petroleum based foams

Urea Formaldehyde Foams



Polyethylene and Polystyrene Foams



Phenol Formaldehyde Foams



Melamine casts/ Compression moldings



Bio-polyols

Soybean Oil



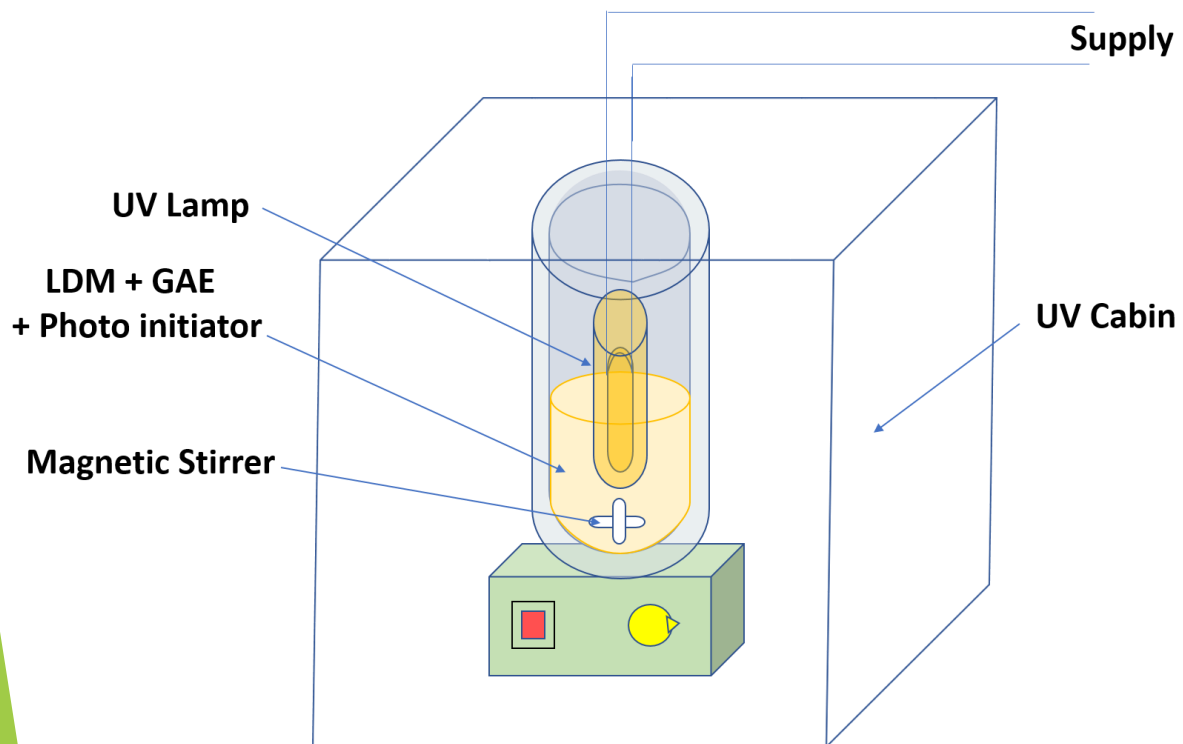
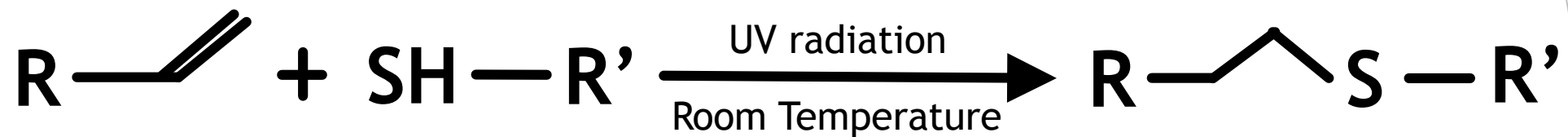
Castor Oil



Limonene



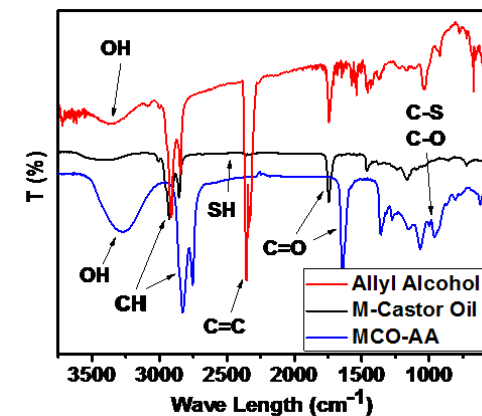
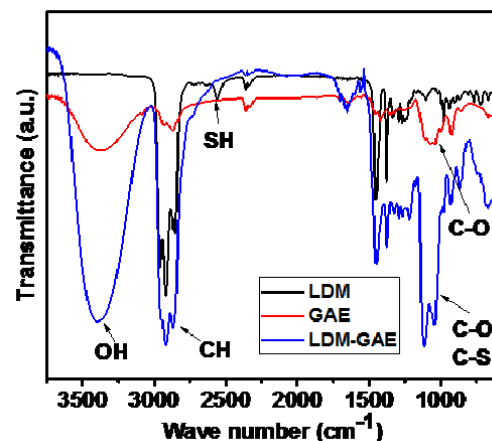
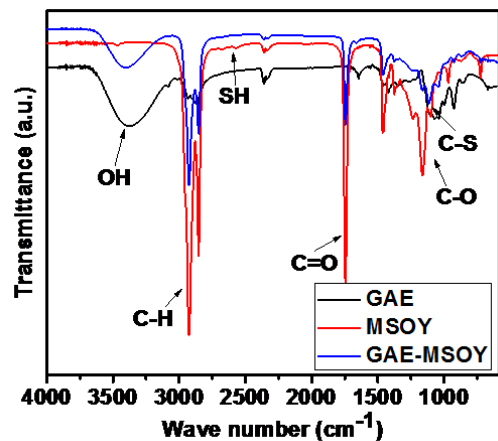
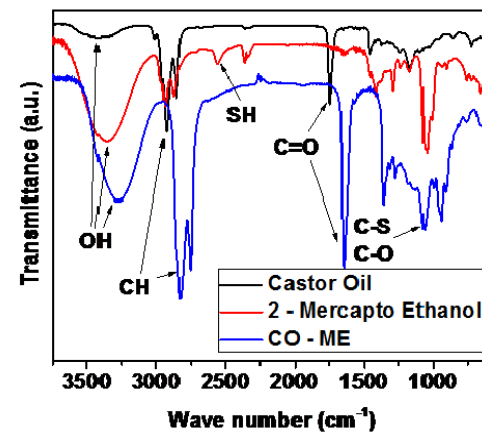
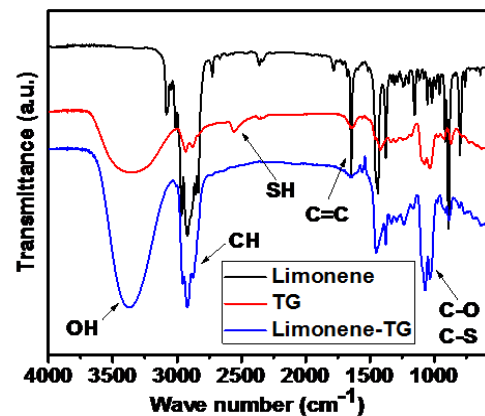
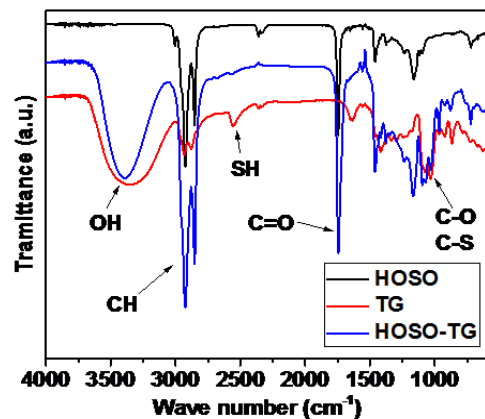
Experimental



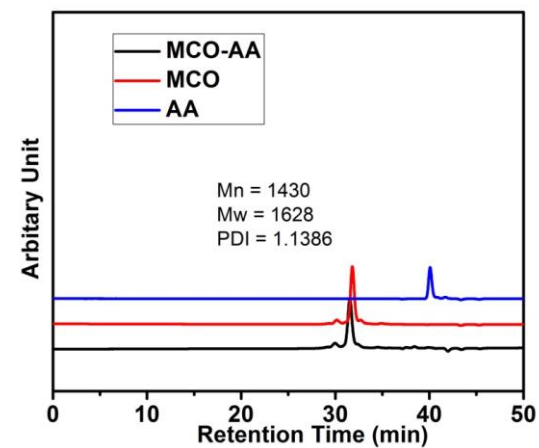
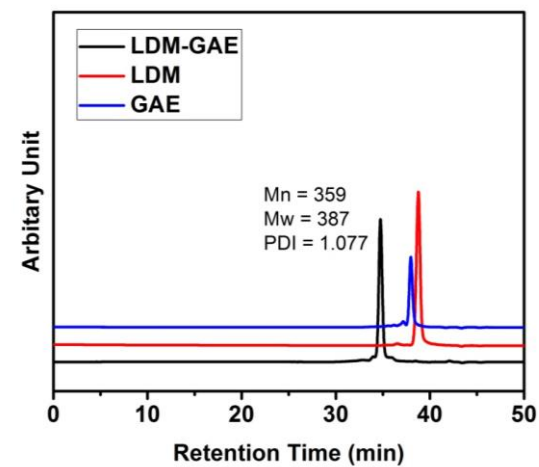
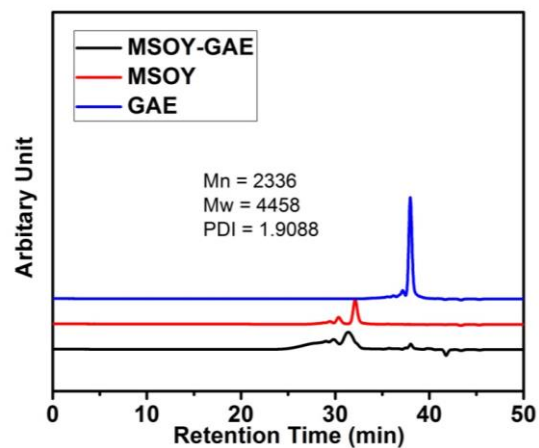
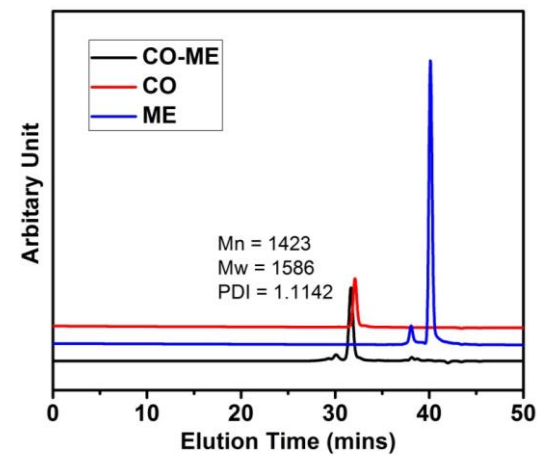
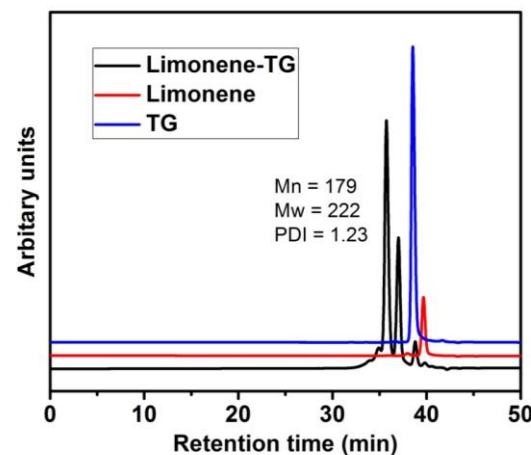
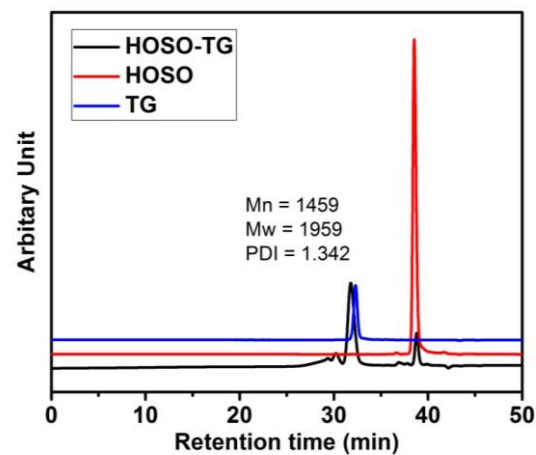
Advantages:

- 1) Room Temperature Reaction
- 2) Single step
- 3) Short reaction time
- 4) Almost 100% yield
- 5) No by products
- 6) No purification step required
- 7) Industrially viable process

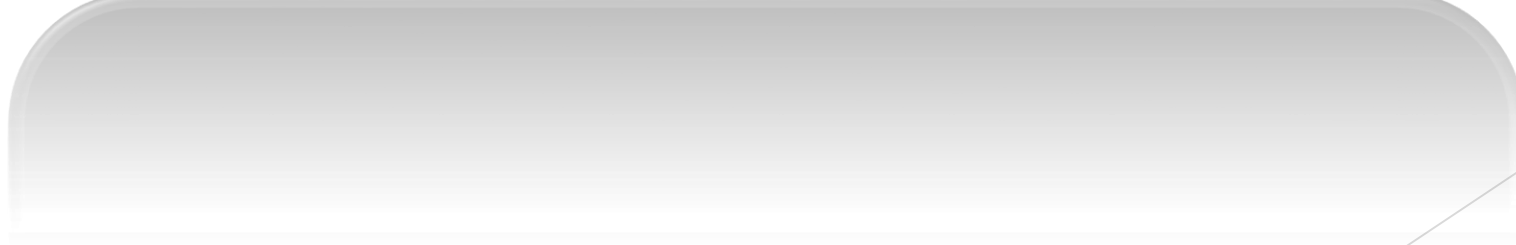
Characterization of Polyols (FTIR)



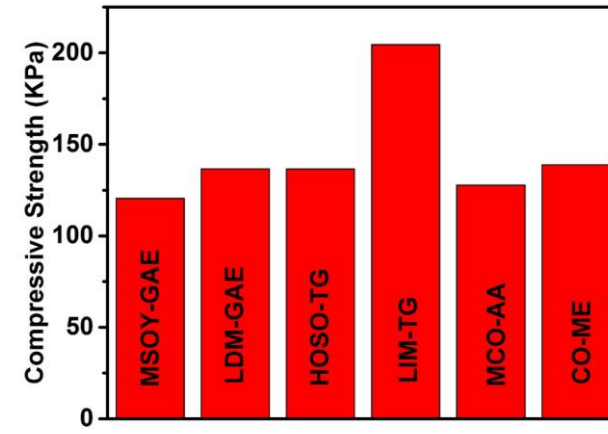
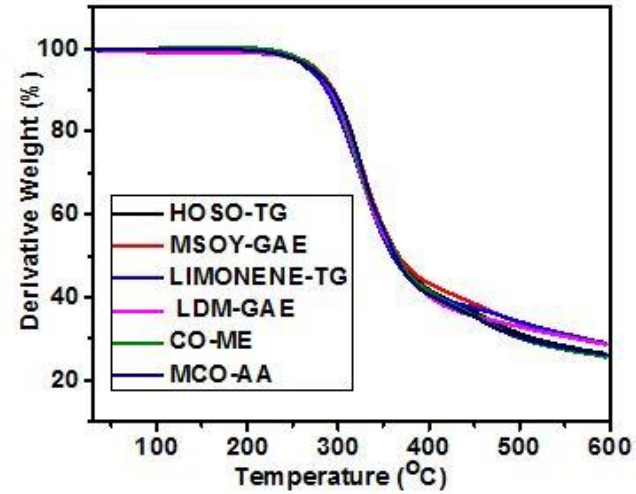
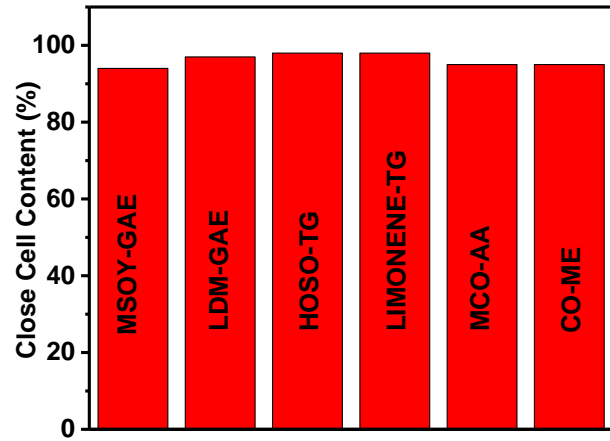
Characterization of Polyols (GPC)



Foaming Process

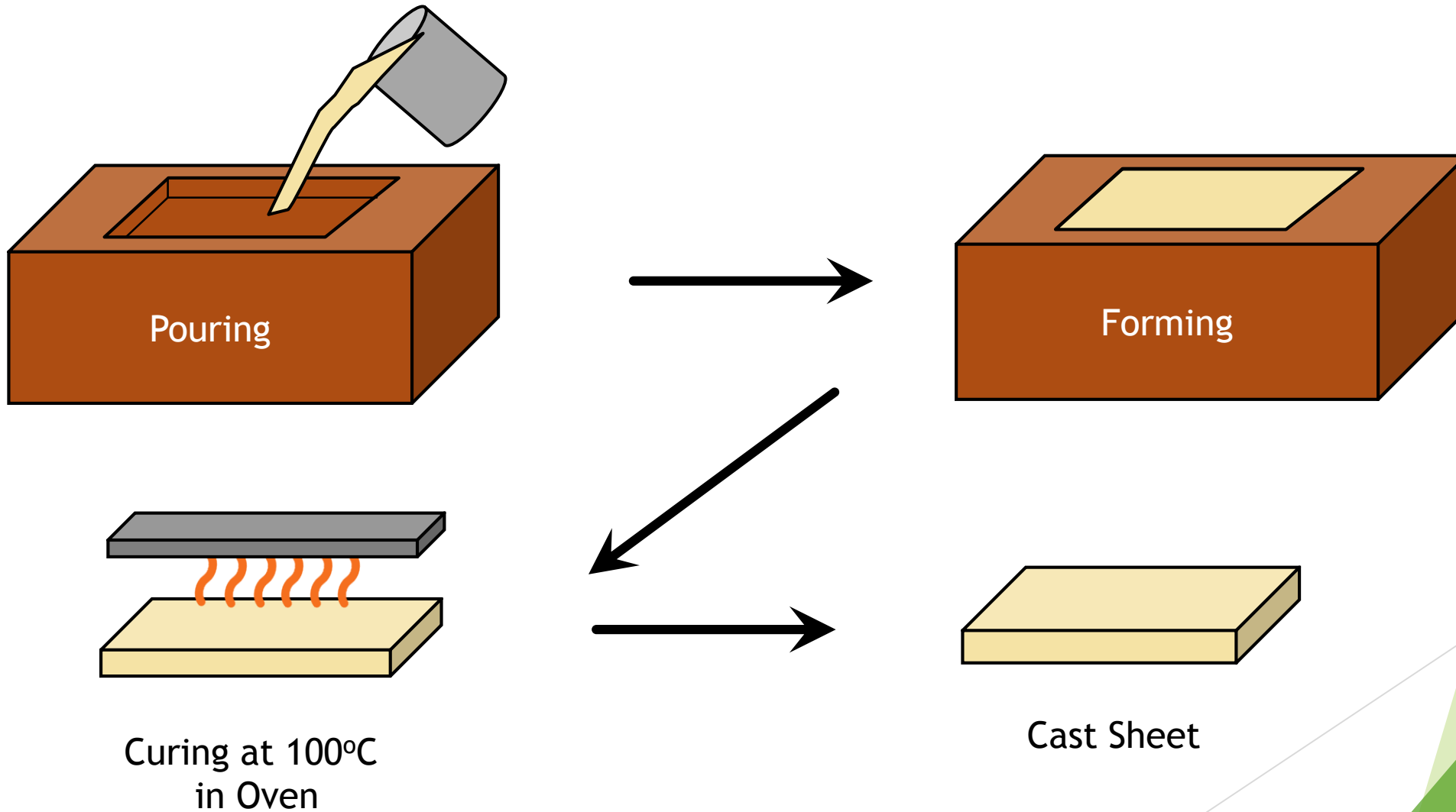


Properties of Foams

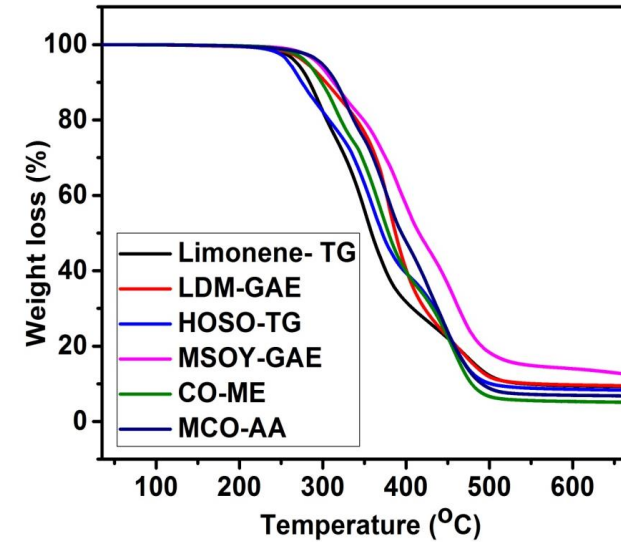
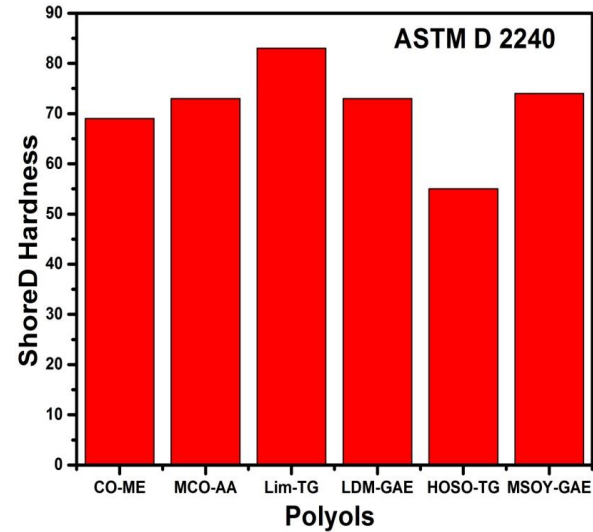
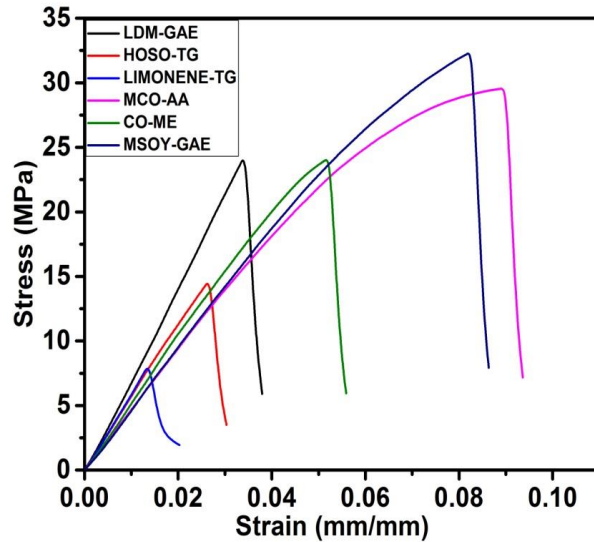


Close Cell Content, TGA and Compression strength of the foams

Casting Process



Properties of Cast Sheets



Tensile strength, Hardness and TGA of all cast sheets

Applications of Casts and Foams



Summary and future aspects of research

Future aspects of research

- Flame Retardant based polyols
- Synthesis of polyols
- Making rigid foams and cast sheets
- Properties of foams and sheets
- Applications overview

References

- ▶ Images are taken from google images for detailing.
- ▶ **Biobased Polyols Using Thiol-Ene Chemistry for Rigid Polyurethane Foams with Enhanced Flame-Retardant Properties**

C. K. Ranaweera, M. Ionescu, N. Bilic, X. Wan, P. K. Kahol and Ram K. Gupta
(DOI: 10.7569/JRM.2017.634105)