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

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

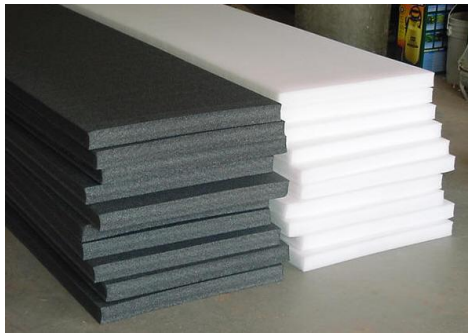
Non sustainable natural resources

- 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

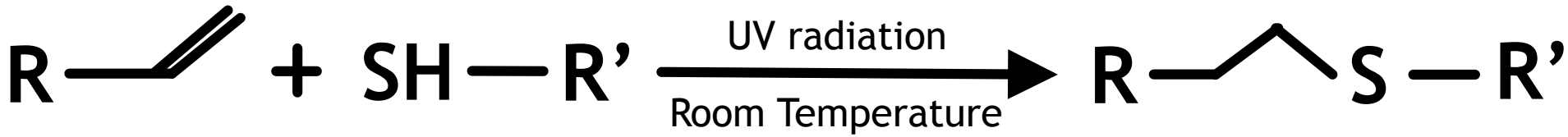
Bio-polyols

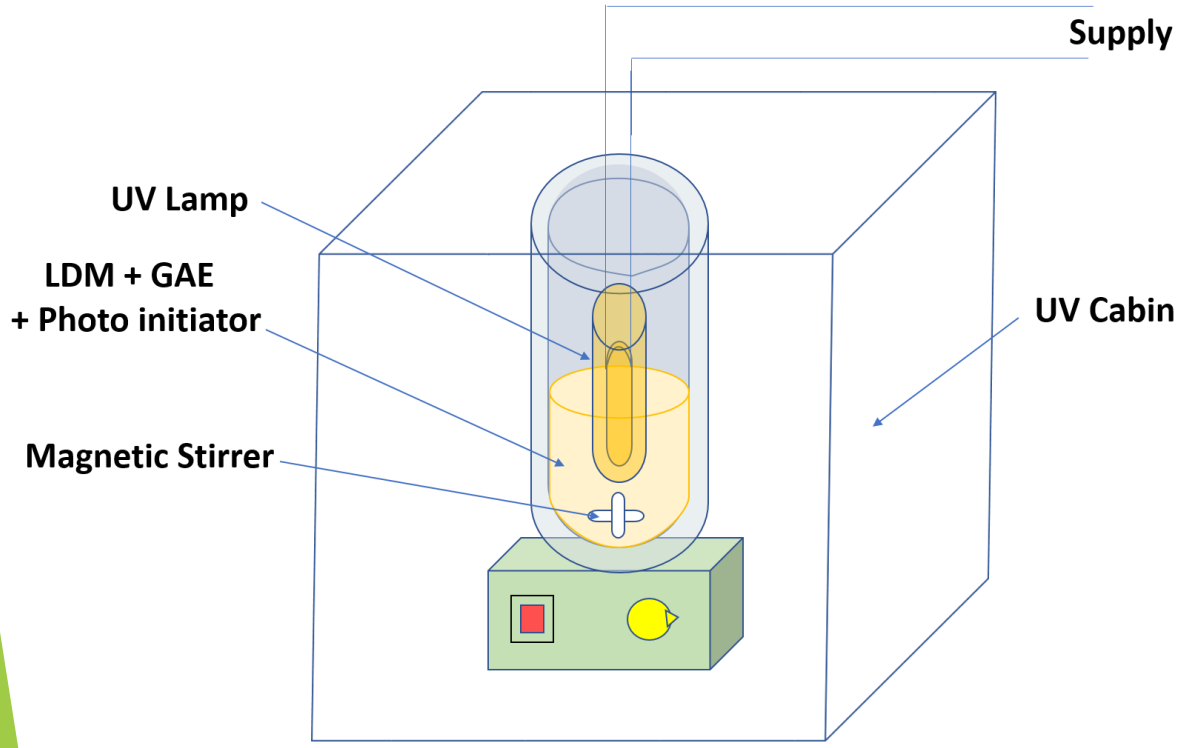
Soybean Oil

Castor Oil

Limonene

Experimental

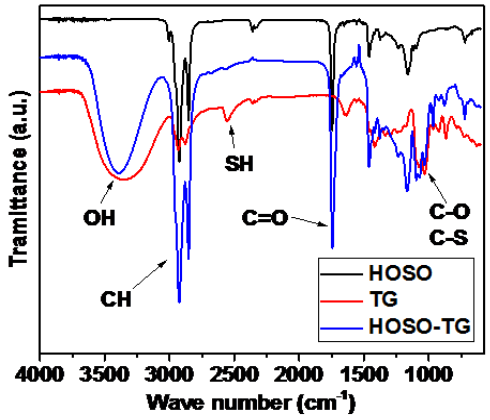


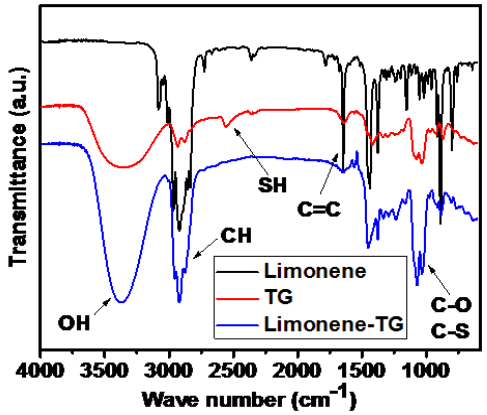


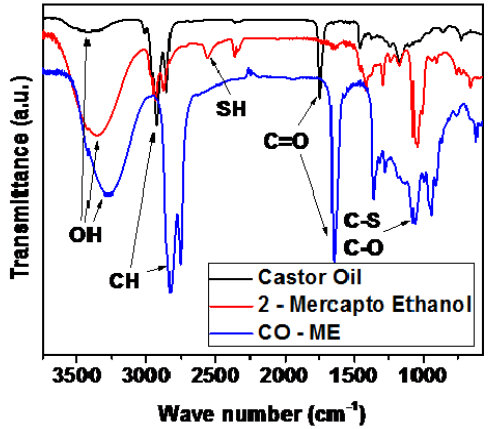
Advantages:

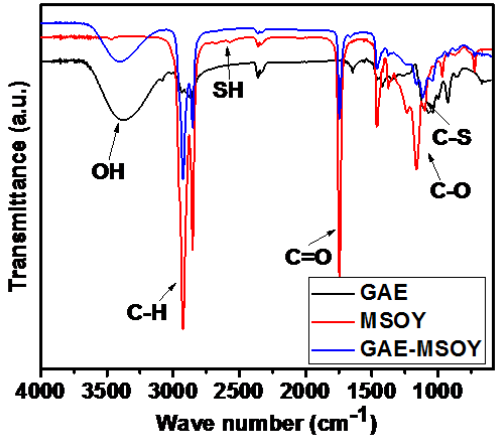
1) Room Temperature Reaction
2) Single step
3) Short reaction time
4) Almost 100% yield
5) No by products
6) No purification step required
7) Industrially viable process

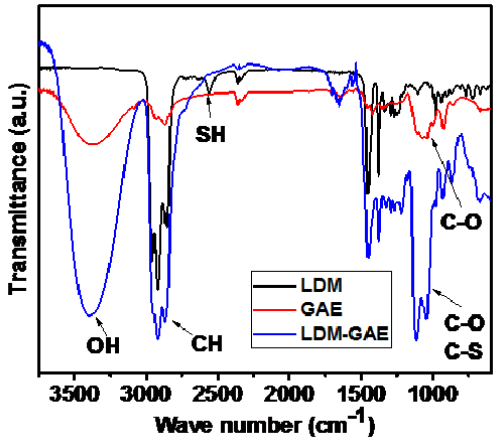
Characterization of Polyols (FTIR)

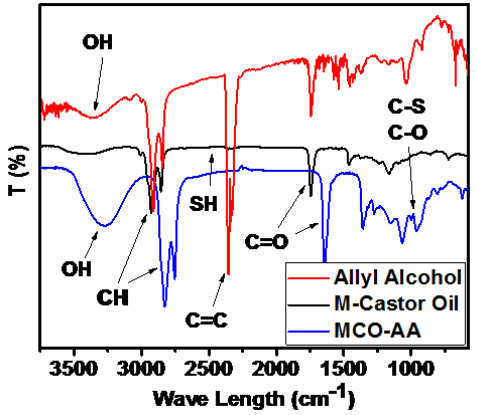




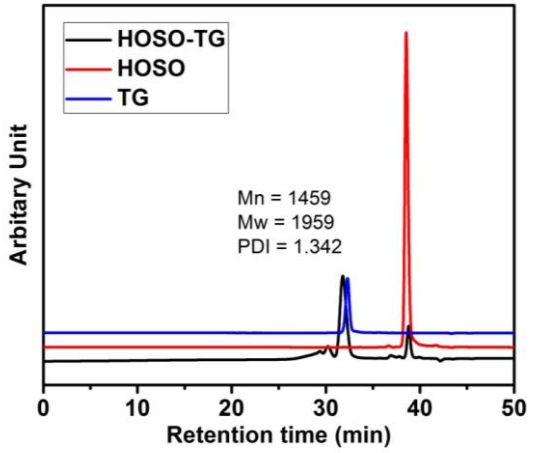


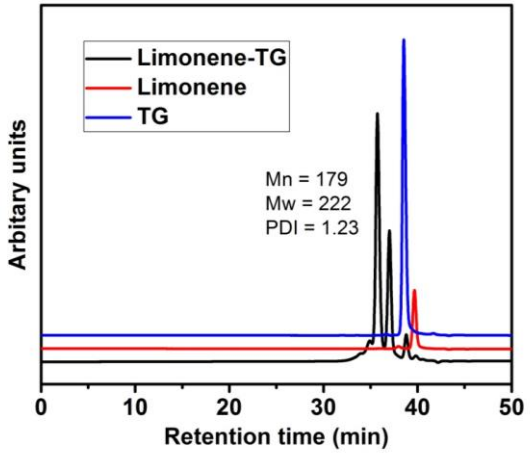


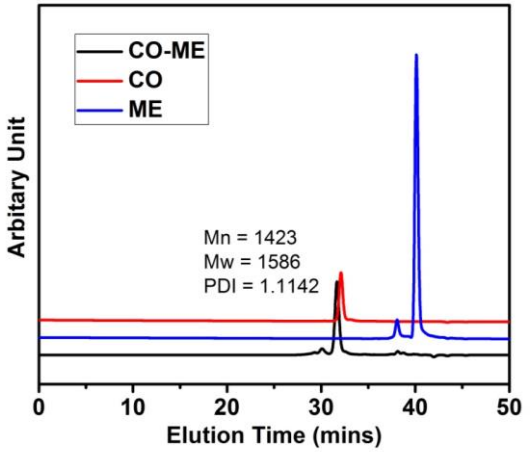


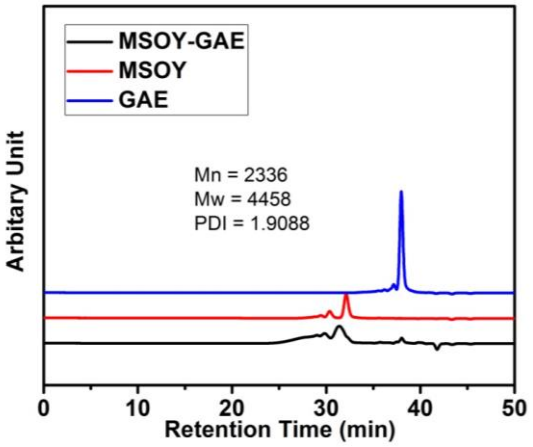


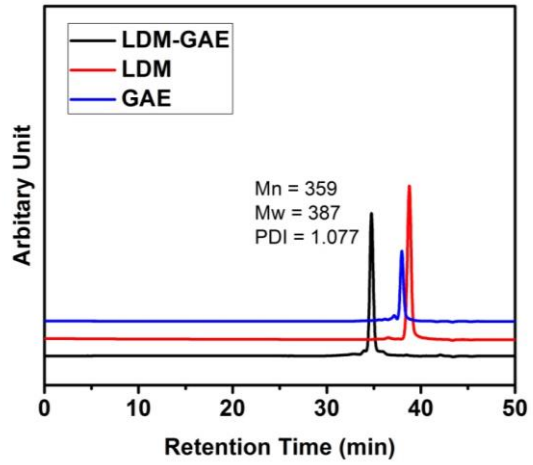
Characterization of Polyols (GPC)

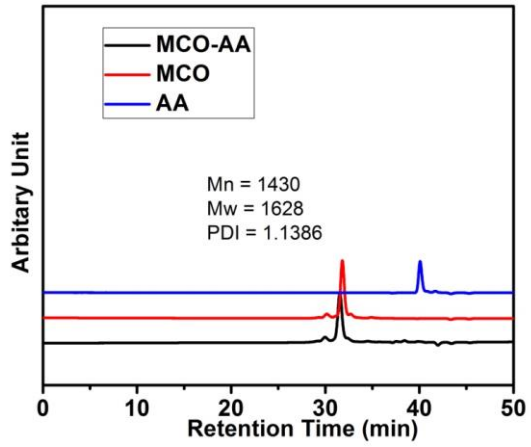






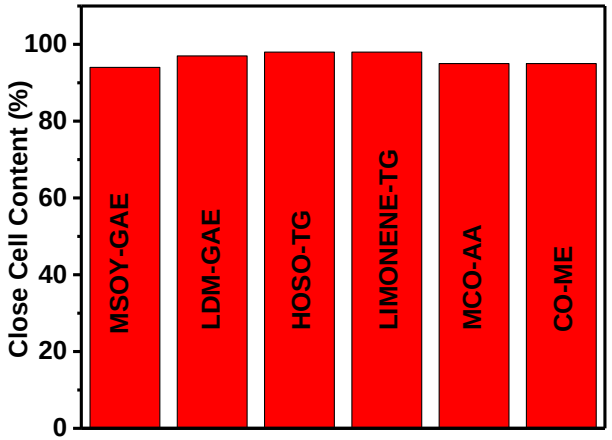


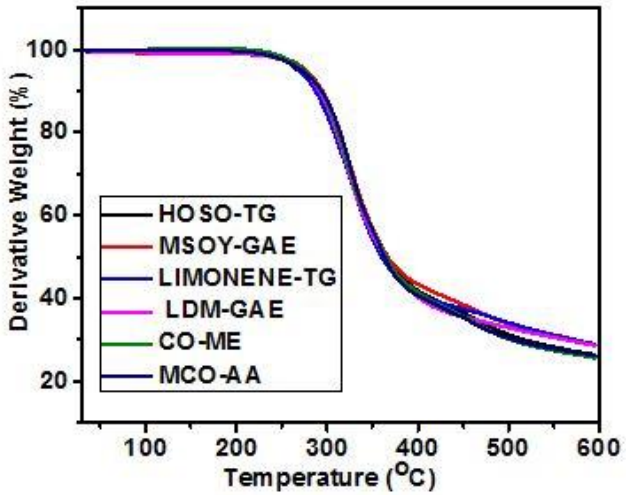


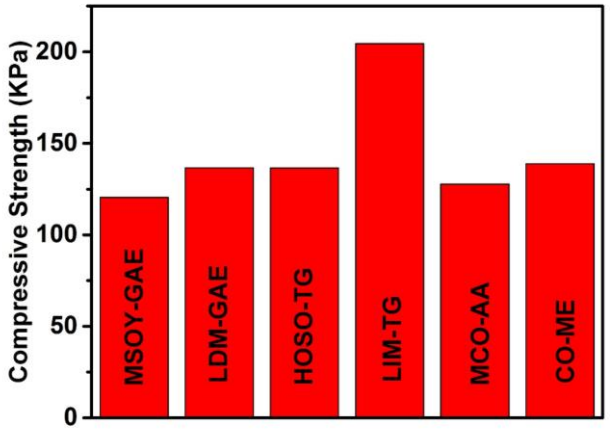


Foaming Process

Properties of Foams

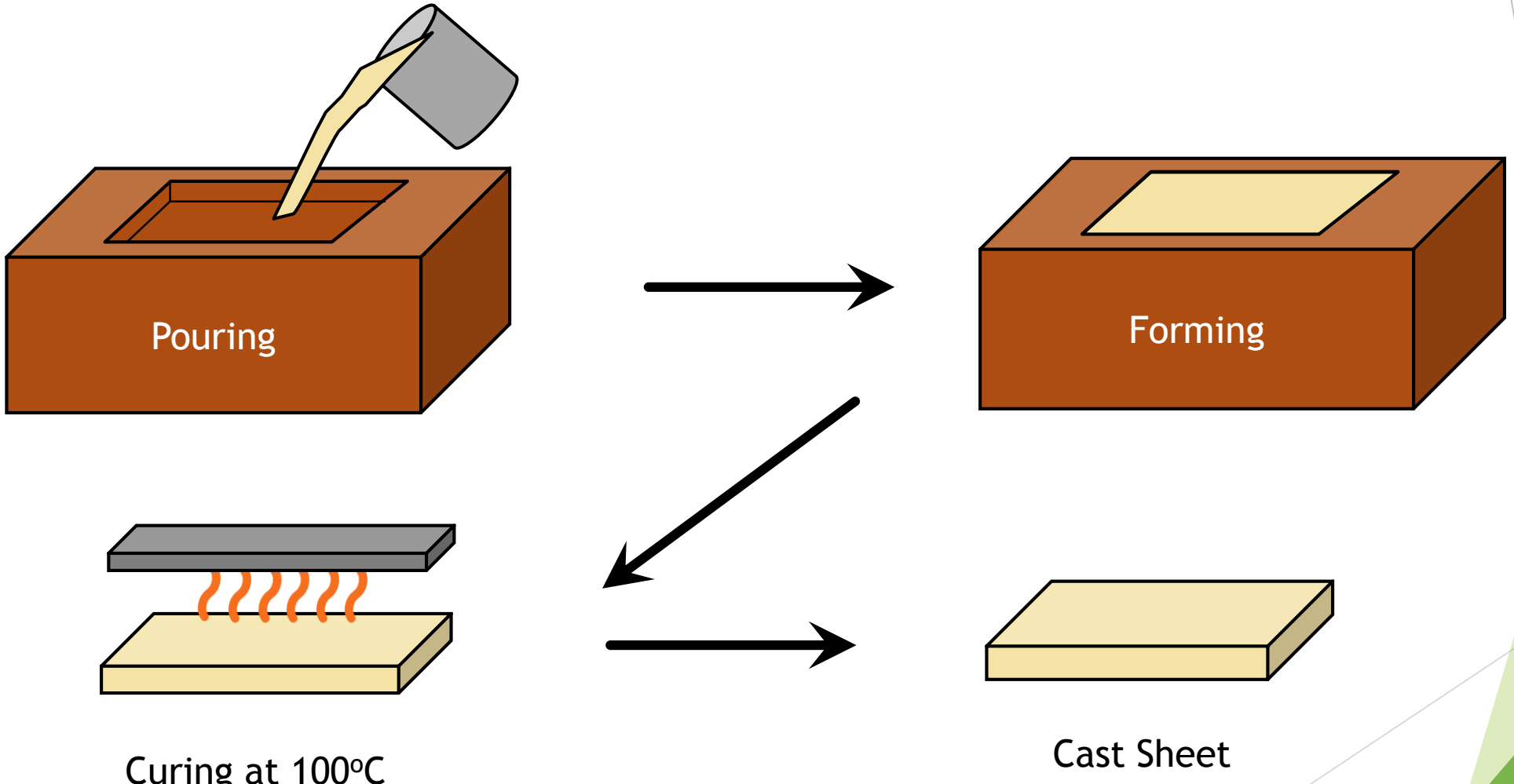




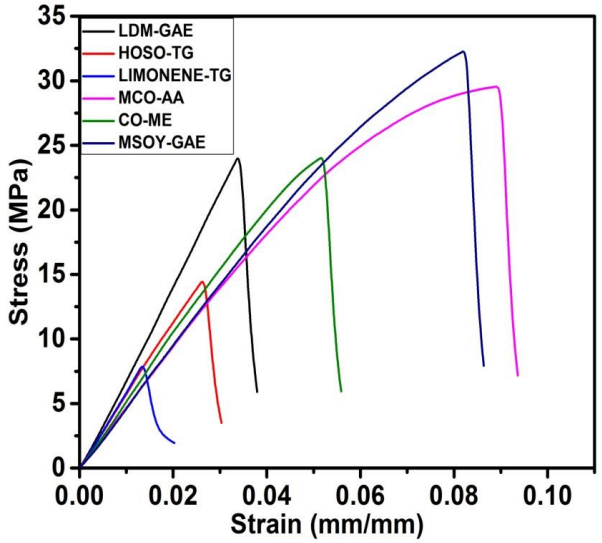


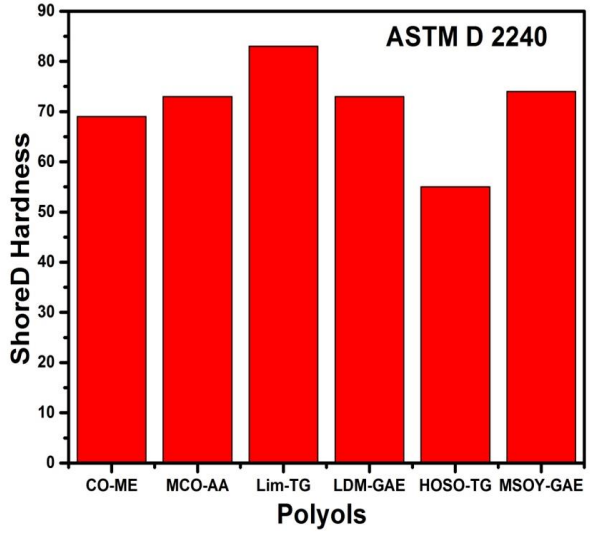
Close Cell Content, TGA and Compression strength of the foams

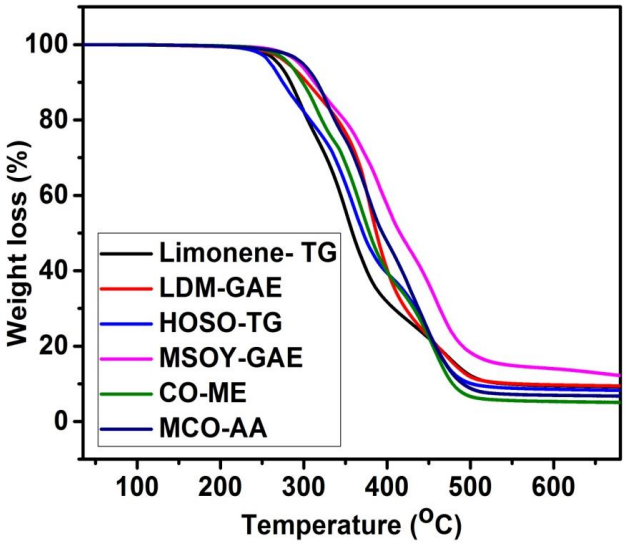
Casting Process



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

- Background of research
- Problems and remedies
- Synthesis of polyols
- Flame Retardant based polyols
- Explore other applications such as elastomers, adhesives, etc.
- 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)