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High-quality Polyurethane Foams and Sheets from Sustainable Natural Resources

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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.

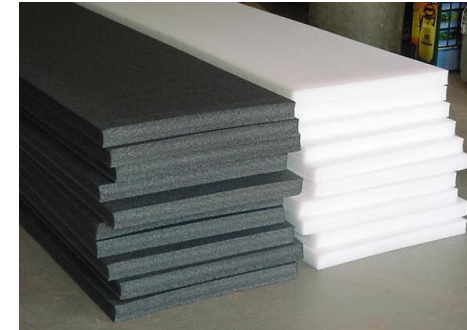


Petroleum based foams

Urea Formaldehyde Foams



Polyethylene and
Polystyrene Foams



Phenol Formaldehyde Foams



Melamine casts/
Compression moldings



Bio-polyols

Soybean Oil



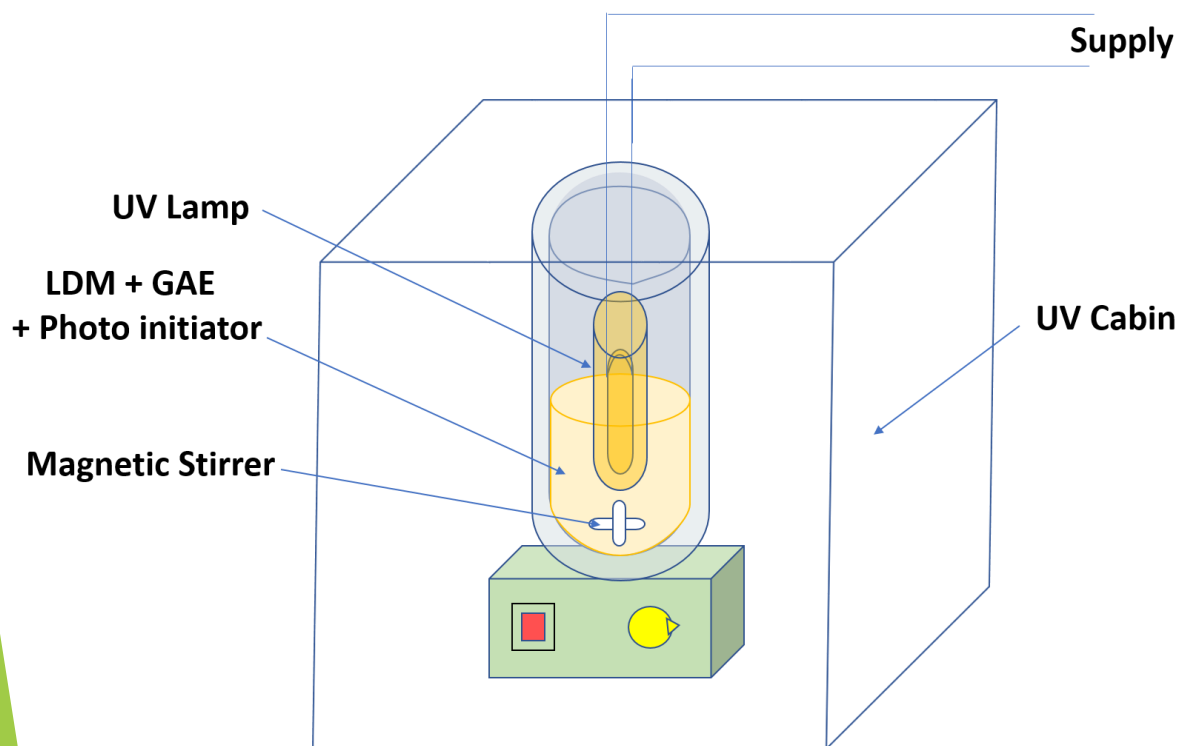
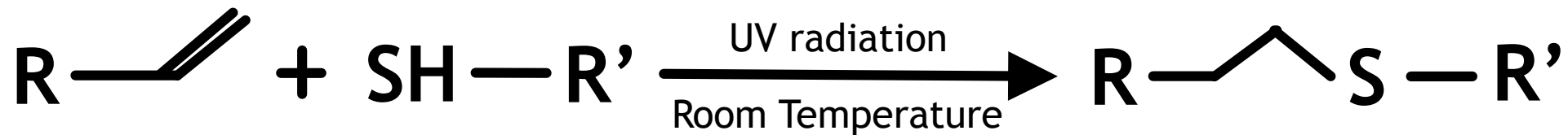
Castor Oil



Limonene



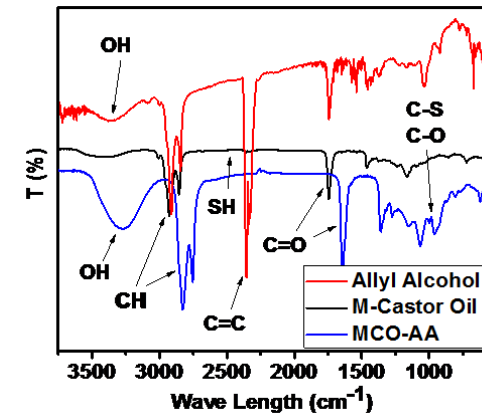
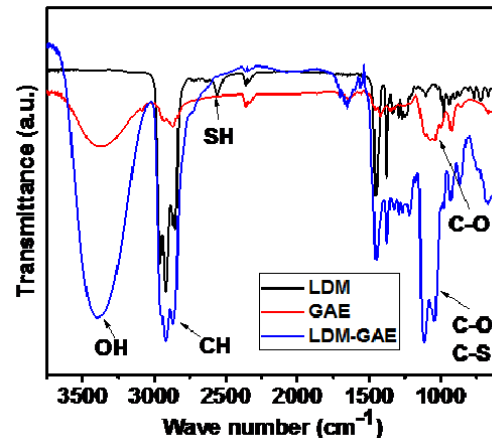
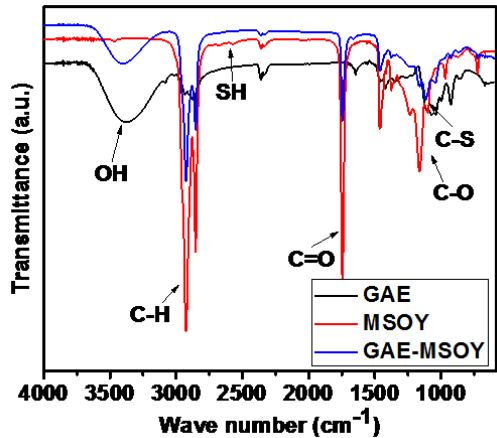
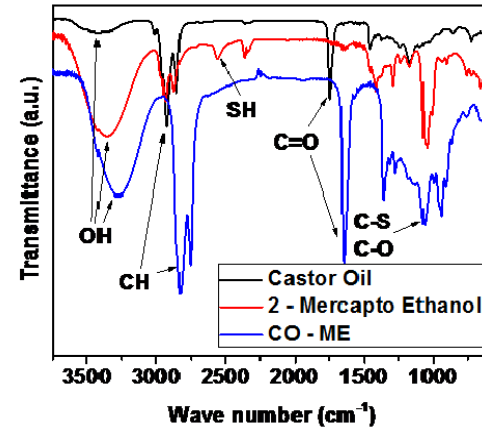
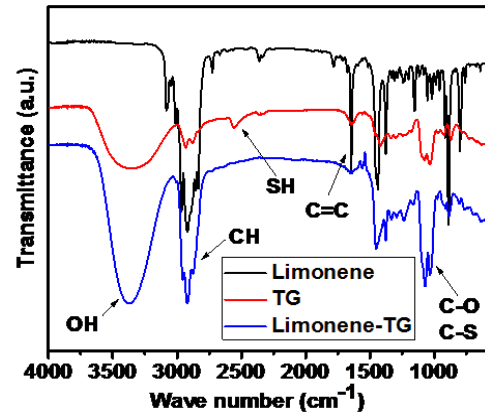
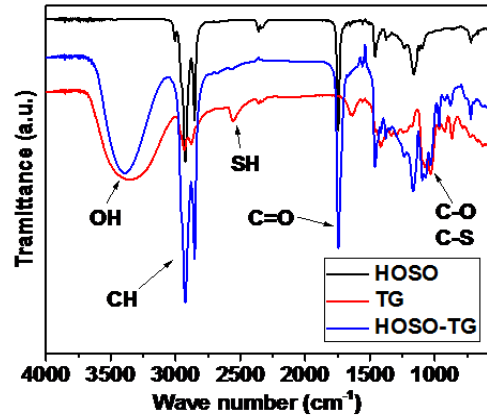
Experimental



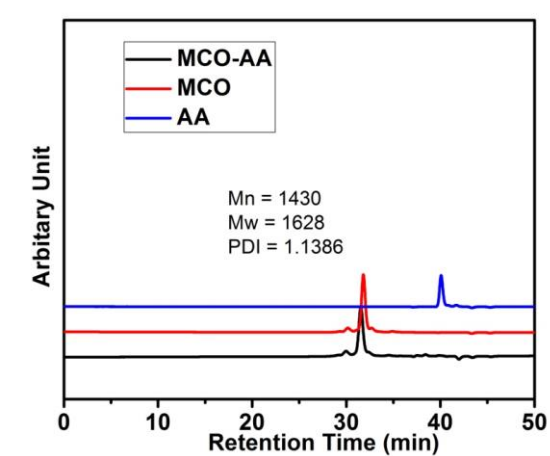
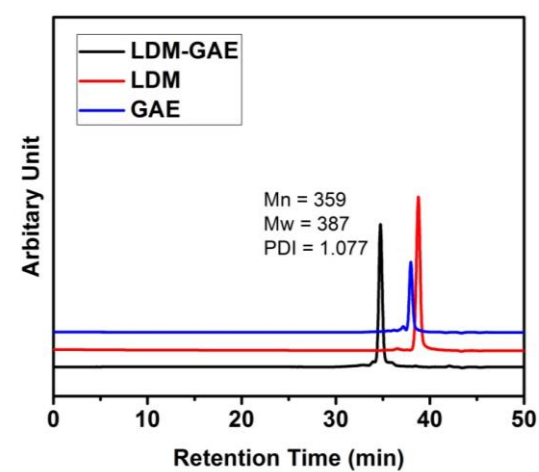
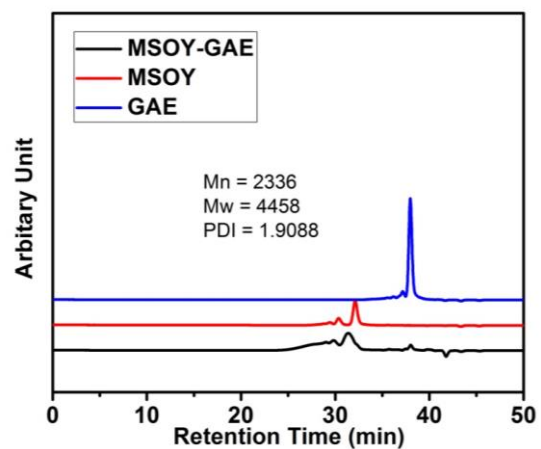
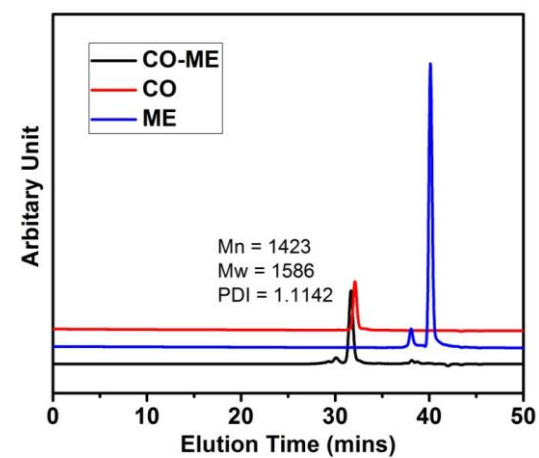
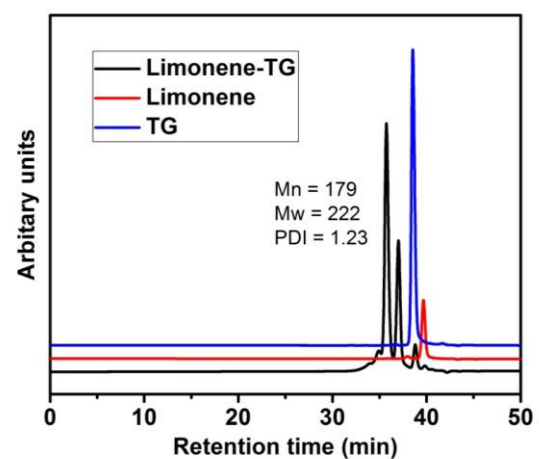
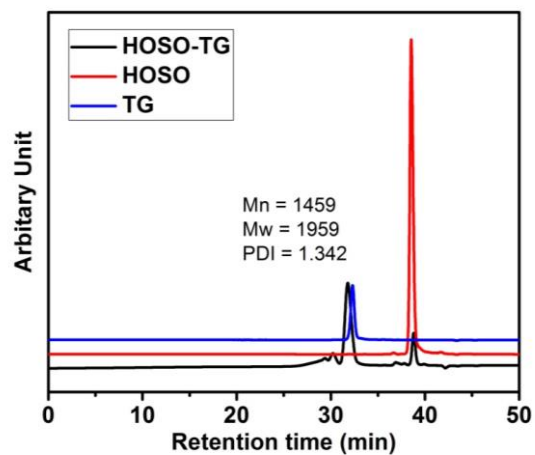
Advantages:

- 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

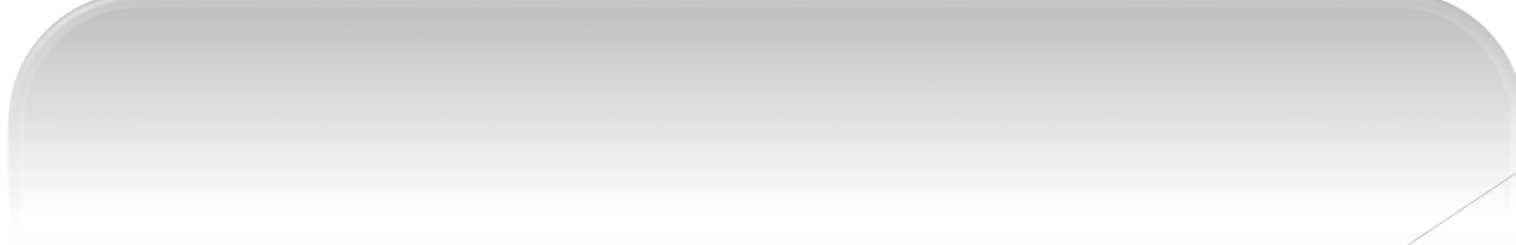
Characterization of Polyols (FTIR)



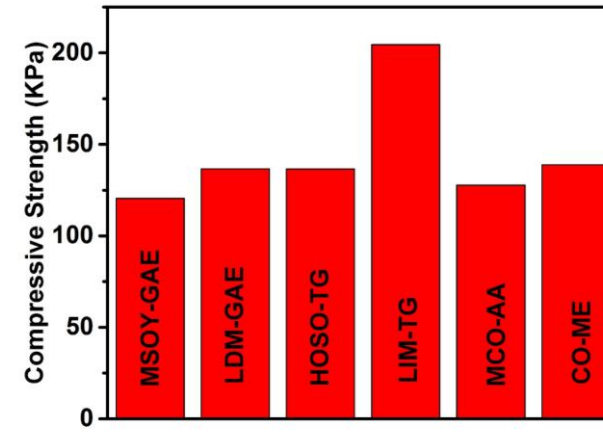
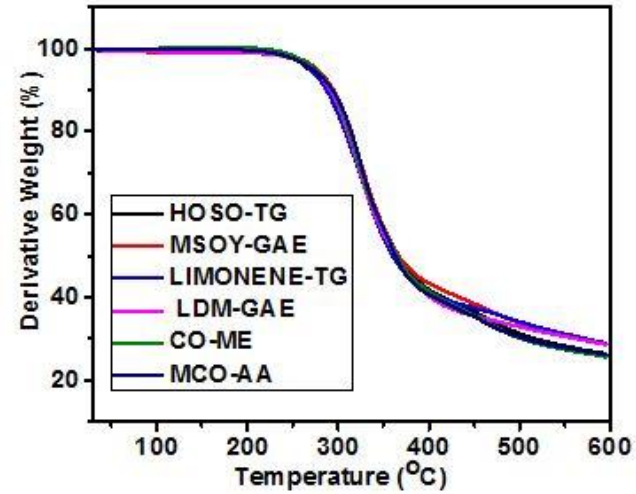
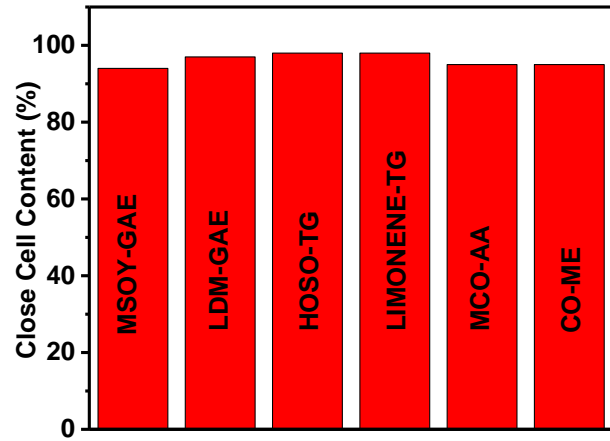
Characterization of Polyols (GPC)



Foaming Process

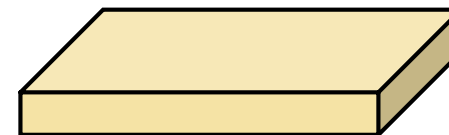
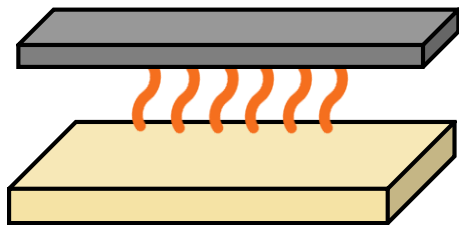
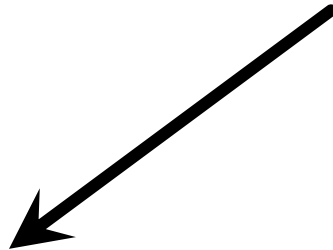
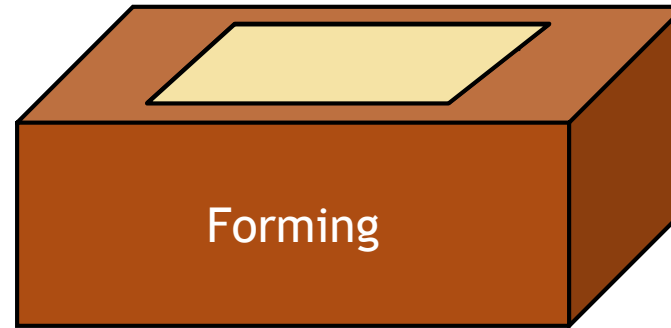
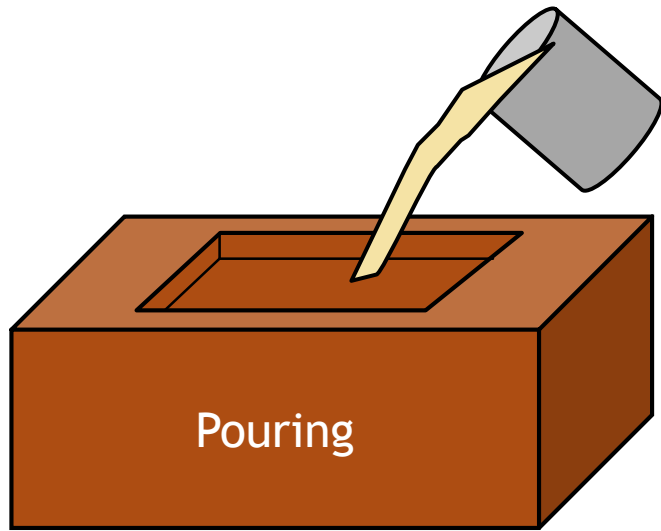


Properties of Foams

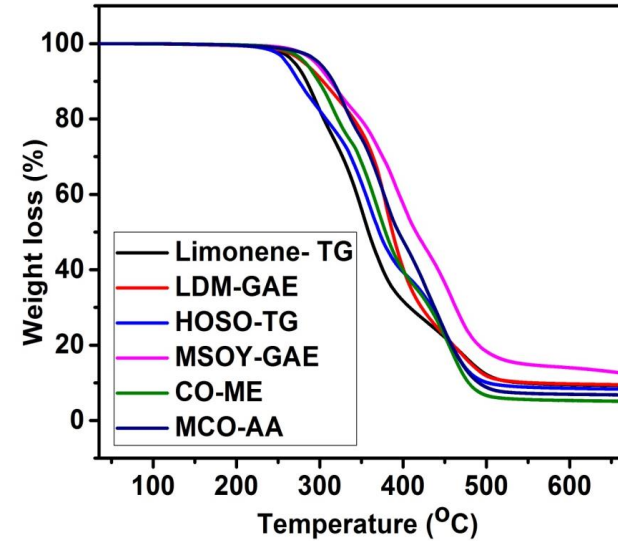
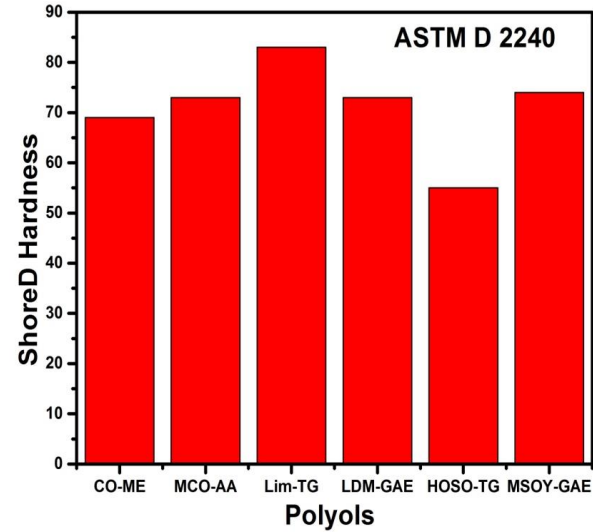
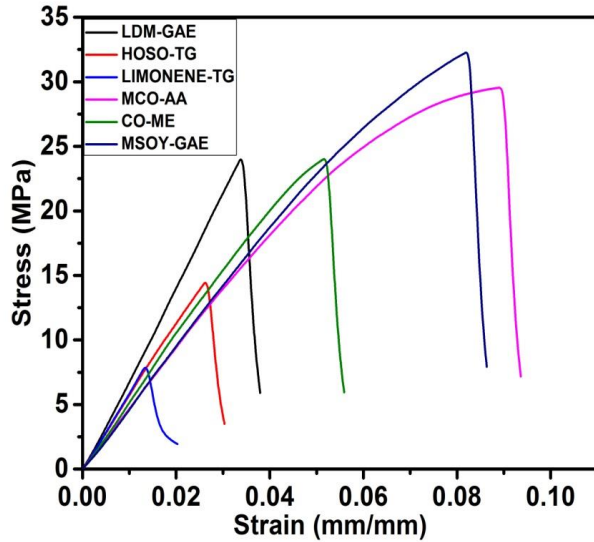


Close Cell Content, TGA and Compression strength of the foams

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 for 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
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