Industry Day Theme
ADVANCED MATERIALS

Development of Citric Acid Based Polyol to Synthesise Waterproof Breathable Waterborne Antibacterial Polyurethane Coated Cotton Fabric

Indrajit Bramhecha and Javed Sheikh*

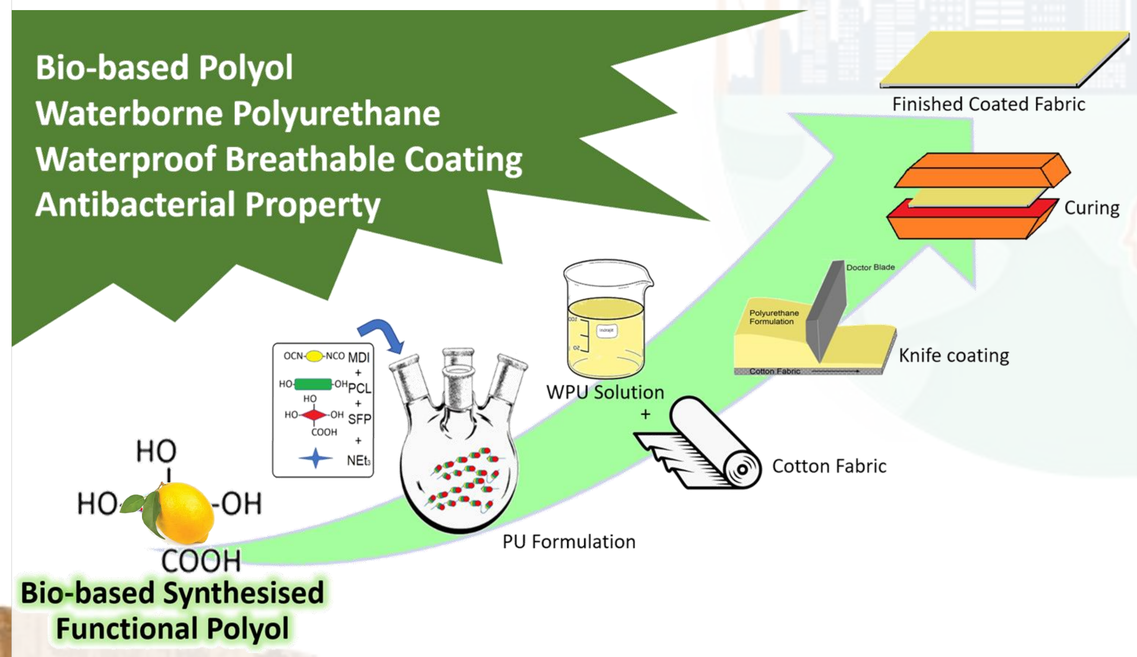
indrajit5193@gmail.com

Department of Textile and Fiber Engineering

Introduction

- PU is widely used polymer in different segment.
- Involves extensive use of volatile organic compounds for application
- PU synthesis involve use of hazardous and synthetic chemicals
- PU Lacks to have inherent Functionality

Materials and Methods



Conclusions

- A novel waterborne antibacterial PU was successfully prepared from bio-based polyol for textile coating.
- The coated fabric displayed varying levels of antibacterial activity (84-99.2%), breathability and thermal stability depending on the SFP concentration.
- This in short provides an opportunity to prepare tailor-made PU for desired properties.
- The enhanced tensile strength and crease recovery angle were also confirmed for the coated cotton.
- Excellent water repellency (100+ cm of water pressure) was displayed by the coated cotton.
- A novel PU was successfully utilized for functional coating of Cotton.

Industrial Significance

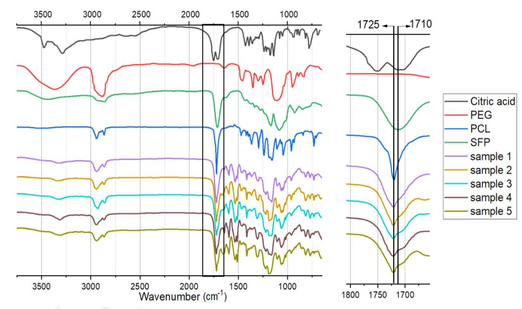
*Solvent Free
*Waterproof breathable
*Sustainable
*Inherent antibacterial
*Waterborne polyurethane
*Bio-Based

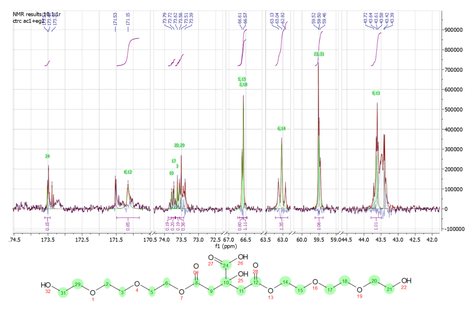
Application: Defense and medical personal uniform, Tents and so on.

Technology Readiness Level:
Waited for Scale-up trials.

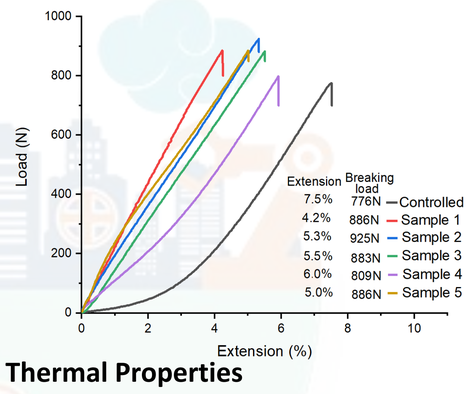
Result

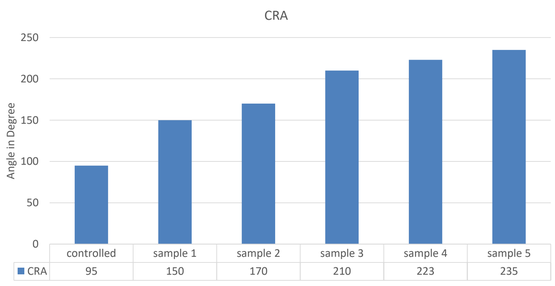
Chemical Characterization



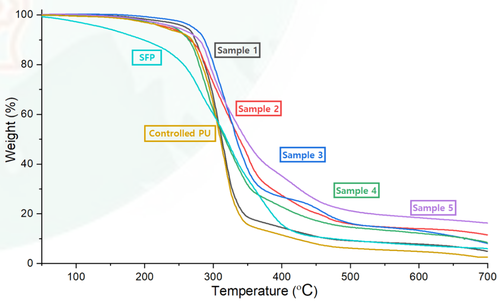


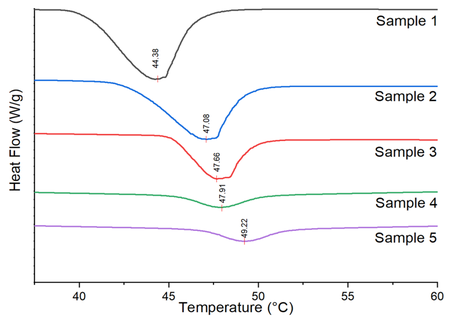
Mechanical Properties



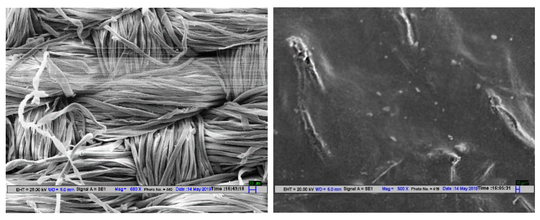


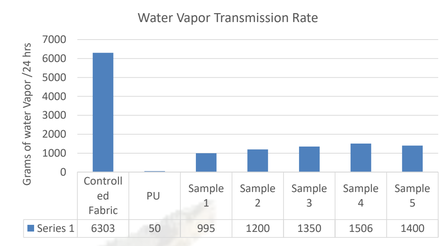
Thermal Properties



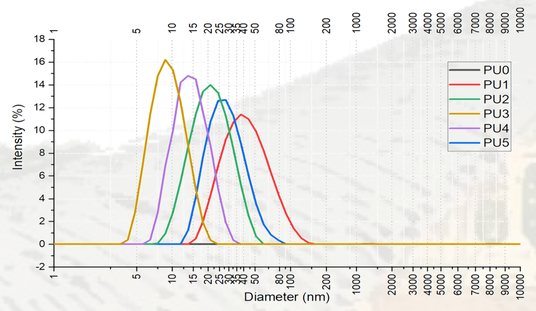


Waterproof Breathable testing

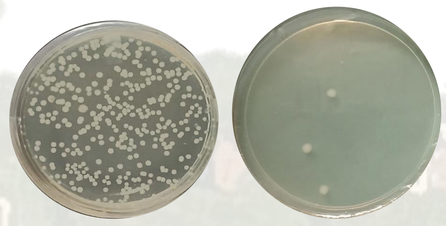




Size Distribution of WPU



Antibacterial Properties



References

Chen, K.; Gou, W.; Wang, X.; Zeng, C.; Ge, F.; Dong, Z.; Wang, C. UV-Cured Fluoride-Free Polyurethane Functionalized Textile with PH-Induced Switchable Superhydrophobicity and Underwater Superoleophobicity for Controllable Oil/Water Separation. ACS Sustain. Chem. Eng. 2018, 6 (12), 16616–16628. https://doi.org/10.1021/acssuschemeng.8b03851.

Cheng, Q.-Y.; Zhao, X.-L.; Weng, Y.-X.; Li, Y.-D.; Zeng, J.-B. Fully Sustainable, Nanoparticle-Free, Fluorine-Free and Robust Superhydrophobic Cotton Fabric Fabricated via an Eco-Friendly Method for Efficient Oil/Water Separation. ACS Sustain. Chem. Eng. 2019, acssuschemeng.9b03852. https://doi.org/10.1021/acssuschemeng.9b03852.

Xie, W.; Pakdel, E.; Liu, D.; Sun, L.; Wang, X. Waste Hair-Derived Natural Melanin/TiO2 Hybrids as Highly Efficient and Stable UV-Shielding Fillers for Polyurethane Films. ACS Sustain. Chem. Eng. 2019, acssuschemeng.9b03514. https://doi.org/10.1021/acssuschemeng.9b03514.

Yoo, H. J.; Kim, H. H.; Cho, J. W.; Kim, Y. H. Surface Morphology and Electrical Properties of Polyurethane Nanofiber Webs Spray-Coated with Carbon Nanotubes. Surf. Interface Anal. 2012, 44 (4), 405–411. https://doi.org/10.1002/sia.3817.

Wang, C.; Ma, C.; Mu, C.; Lin, W. Tailor-Made Zwitterionic Polyurethane Coatings: Microstructure, Mechanical Property and Their Antimicrobial Performance. RSC Adv. 2017, 7 (44), 27522–27529. https://doi.org/10.1039/c7ra04379a.

Your content goes here…

Acknowledgement

MHRD and IIT Delhi for providing funds and facilities for research work