International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 08 | August 2022 www.irjet.net p-ISSN: 2395-0072

NOISE ABSORBING MATERIAL USING BIOPOLYMERS

Md Seraj Uddin[1], Rahul Sharma[2]

[1]Student, Dept. of Civil Engineering (M.Tech), RadhaRaman Engineering College, Bhopal
[2]Assistant Professor, Dept. Of Civil Engineering, RadhaRaman Engineering College, Bhopal

---

Abstract - *Biopolymers reduce the demand for traditional, organic, or propane nutrient products as a part of the "green" industry. As these biofibre and bilayer materials change, their ratios as well as their biological and mechanical characteristics are evaluated and quantified. The investigation is using agricultural garbage, which has intrinsic unpredictability. For frequencies between 0.30 and 3.0 KHz, ASTM E1050 (2012) criteria was used to calculate the rates of sound insulation. ASTM D412 investigated the vibrations of biopolymers and developed statistical measures for the mechanical and physical properties.*

Reduced density, increased anechoic factor, decreased ultimate tensile strength (UTS) were among the correlations between material properties and increasing biofibre. Given that trade-offs among these traits are frequent, this innovation is crucial for maximising material selections when creating items.

Key Words: **Biopolymers, Ultimate tensile strength, ASTM D412, Evaluated, Correlations**

1. INTRODUCTION

"Biopolymer" is an odd and frequently used phrase in modern bioengineering. Hybrids are substituting natural materials like flaxseed, grains, flax, and numerous other organic fibres for standard strengthening components like polycarbonate. Despite the fact that this research has been ongoing for 2 decades, there are still numerous significant gaps in the data.

1.1 OVERVIEW

The noise absorption rate was particularly calculated using a tubes, two microphones, and computerised analytical techniques. Due to variances in biopolymers made from reconditioned wastewaters' component parts, each dataset sample's computed property values for a particular material mixture were drastically changed.

1.2 SCOPE

Mixtures of agricultural waste, tyre powder and nylon have been used to create novel nanocomposites. The research aims to clarify material features such as densities, tensile, mechanical qualities, plasticity, and acoustical properties. It also investigates aspect correlations from one material to another.

1.3 APPLICATION

The bulk of functions are used in the automobile, food, textile, and construction industries today. Increasingly bioplastic products, including decorative panels, Eco-bricks, bio-shingles, and greenhouse substances, are being used in building materials. Examples include a coir fibre reshaped duffle bag made by Stemergy from composites reinforced and polypropylene to use adhesion reshaped nanofiber material.

2. METHODOLOGY

To meet functional objectives, the relevant properties must be selected or optimized while creating biopolymers. Some examples of capabilities include concentration, tension, lateral or shearing strength, roughness, flexibility, acoustical coefficient, permeability, and/or other properties. Biopolymers can be blended or mixed using a variety of methods to maximize fiber-matrix adhesion.

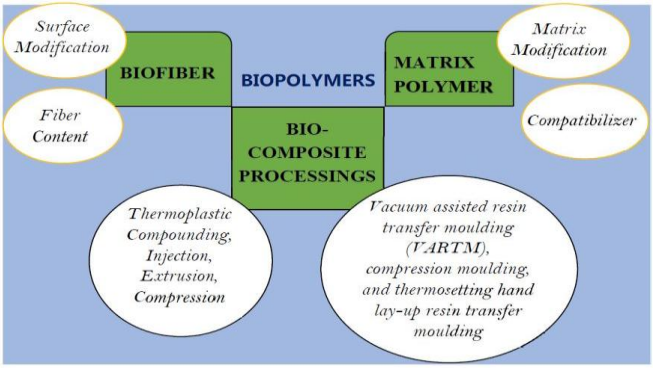

Figure: Biopolymers synthesis procedures

2.1 MATERIAL PREPRATION

In a standard research setting, samples are created by die cutting prior to testing. To make the noise specimens, a die with a diameter of 65 mm (2.5 inches) was used. After 10 identical specimens were evaluated, the conclusions were provided as such aggregate of the samples analyzed.

Figure: Die tool for creating acoustical sample

2.2 EXPERIMENTAL PROCEDURE

At each form of biopolymer, noise absorption measurements were performed a total of 8 times. The data collection technique for the PULSE peripheral device was utilized to tweak and validate the precision of the findings. Methodology section improves the accuracy of test results so that they are used to refer to the process.

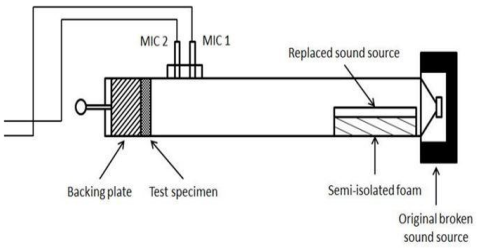

Figure: The impedance tube 4206-A's design

According to ASTM D412 standard, the mechanical test of strength was conducted using a Universal testing machine with a cross-head speed of 5 mm/min. A test's failure means that's over. A ultimate load value, along with load and displacement data, are logged during the trial.

3. ANALYSIS

The research offers a critique of the various predictive methods and topologies pertaining to biofibre concentration, dimensioning, and fracture toughness. The main conclusions were that, in terms of value, HH-CCT-PP combinations outperformed three other forms of biopolymers that used the same quantity of biofibrilla. Compared to FCT and LLDPE combinations, they have larger elastomeric nanostructure and more complex fundamental polymer topologies. In aspects of noise canceling, WSH polymers performed well than types of composites. The WSH-FCT-LLDPE combination produced the best noise reduction findings.

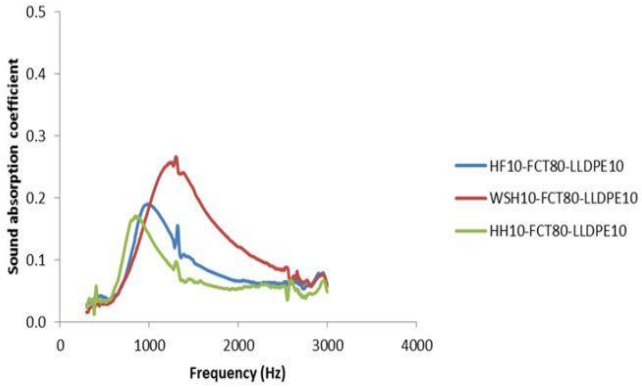

Figure: Noise absorption profiles for biopolymers

3.1 BIOPOLYMER NOISE ABSORPTION FACTOR

Like the proportion of the fibres expanded by 10% to 50%, the hemp hurd's (HH) peak value goes up from 0.17 to 0.31. The pulse width changed from 840 Hz to 1310 Hz until flopping to 1230 Hz.

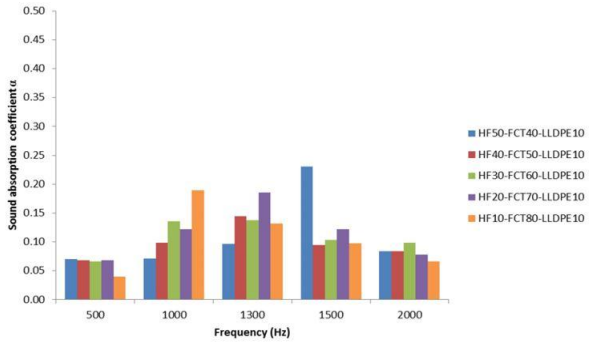

Figure: Comparison of data at specific frequencies

Whole-stalk hemp biocomposites (WSH-FCT-LLDPE) shown notable designs compared to other biopolymers. Accuracy for HH20- FCT70- LLDPE10 was 0.21 at 1 kHz. At 1500 Hz, or 0.42, the 30 percent share of WSH has reached its peak.

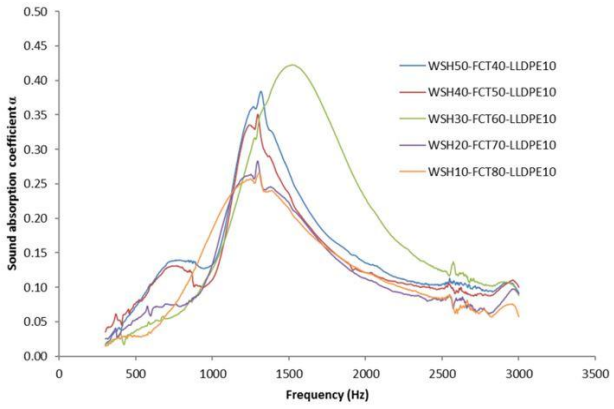

Figure: Frequency profiles for WSH-FCT-LLDPE comparison

4. CONCLUSIONS

Biopolymers are becoming more significant in the transition of recyclable resources as pollution problems like landfill strain and CO2 pollution face an aggravating dilemma. Efficient manufacturing techniques are being devised to employ bio-based goods as effectively as feasible. To create practical standards of practice for biopolymers, the International Organization for Standardization (ISO) and the American Society for Testing and Materials (ATSM) are also required (ISO). This promotes the modernization of bioproducts by providing evaluation and standardized standards to assist in producing simple and straightforward items that will meet market expectations. With the expansion of science and technology and the development of useful materials, biopolymers have a huge future potential. The advancement of biopolymers will help society as a whole to safeguard our environment.

5. RECOMMENDATIONS AND FUTURE WORK

Study can be performed on a number of aspects of biopolymer, including fibers pre-processing and various production processes. The results could contribute to an increase in compressive properties and/or noise suppression. The essential achievements are the creation of a broad product proposal, experimentation, and inspection, as well as the conclusion of commercialization manufacture.

REFERENCES

[1] Mohanty, A.K., Misra. M., & Drzal, L.T. (2002, April). Sustainable Bio-Composites from Renewable Resources: Opportunities and Challenges in the Green Materials World. Journal of Polymers and the Environment, Vol. 10, Nos. ½.

[2] Oldham D.J., Egan C.A., & Cookson R.D. (2011). Sustainable acoustic absorbers fromthe biomass, Applied Acoustics 72: 350–363.

[3] Flax Council of Canada (2015). Chapter 12: Flax Straw and Fibre Past and Present Uses, *Growing Flax - Production, Management & Diagnostic Guide*. Retrieved from http://flaxcouncil.ca/wp-content/uploads/2015/02/FCOC-growers-guide-Chapter- 12-Flax-Straw-and-Fibre.pdf

[4] ASTM E1050 (2012). "Standard Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones and a Digital Frequency Analysis System", ASTM International, West Conshohocken, PA, United States.

[5] Seddeq, H. S. (2009). Factors influencing acoustic performance of sound absorptive materials. *Australian Journal of Basic and Applied Sciences,* 3(4), 4610-4617.

[6] Yang, H. S., Kim, D. J., Lee, Y. K., Kim, H. J., Jeon, J. Y., & Kang, C. W. (2004). Possibility of using waste tire composites reinforced with rice straw as construction materials. *Bioresource technology*, 95(1), 61-65.