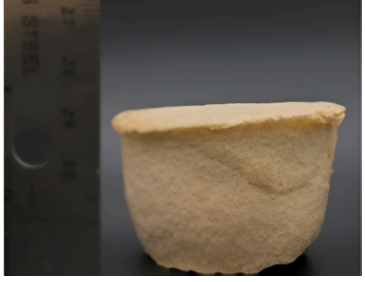

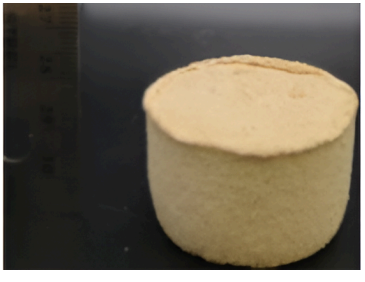
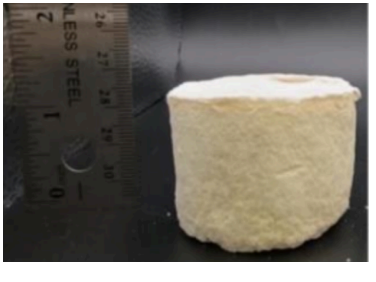
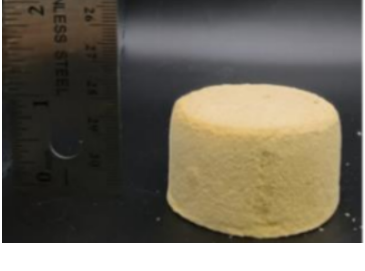



## Individual wt% of Hemp and Aspen Lignocellulose (No Additives)

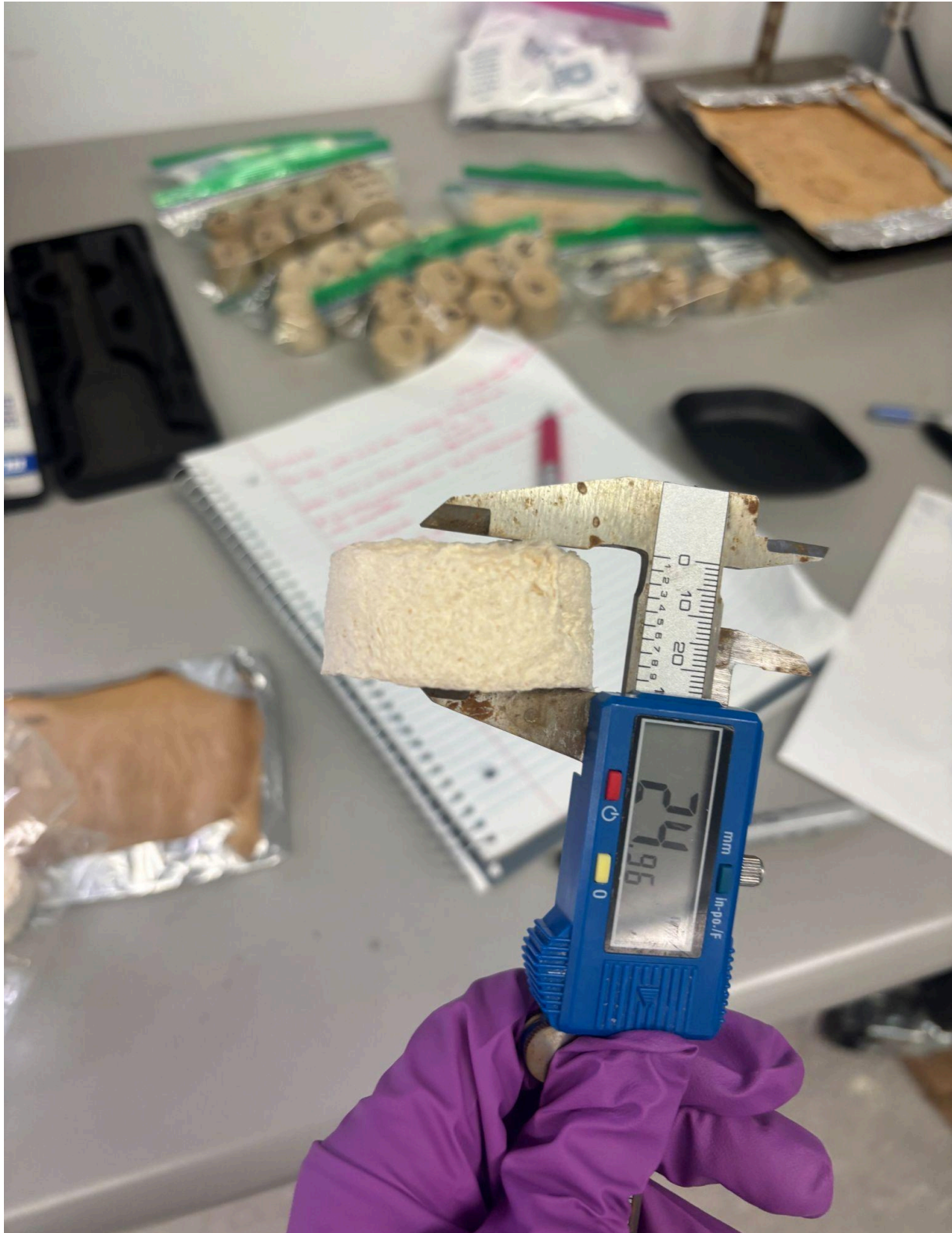
	Picture of Foam		Picture of Foam
4 wt% hemp		4 wt% aspen	
5 wt% hemp		5 wt% aspen	
6 wt% hemp		6 wt% aspen	

Both 5 wt% of hemp and 5 wt% of aspen generated the most optimal structural stability and shrinkage change was lowest, meaning it foamed better than other options.

**Volume Shrinkage:** (compares volume of foam before drying and after drying)

$$\text{VOLUME SHRINKAGE} = \frac{\text{VOLUME OF DRY FOAM} - \text{VOLUME OF WET FOAM}}{\text{VOLUME OF WET FOAM}} \times 100\%$$

## Volume Measurement Apparatus → Caliper



**Volume Calculation:**  $V_{\text{cylinder}} = \text{height} \times \pi \times \text{radius}^2$  (units:  $\text{m}^3$ )

**Density:** (determines durability and support → high density is superior and longer-lasting)

$$\text{DENSITY OF FOAM} = \frac{\text{MASS OF FOAM (KG)}}{\text{VOLUME OF FOAM (M CUBED)}}$$

Lignocellulose Foam	Average Volume Shrinkage (%)	Average Density ( $\text{kg}/\text{m}^3$ )
5 wt% Hemp	50.10	86.0
5 wt% Aspen	21.91	72.0
3 wt% Hemp + 2 wt% Aspen	33.92	85.2
3 wt% Hemp + 2 wt% Aspen + Clay	27.68	104.0
3 wt% Hemp + 2 wt% Aspen + Clay + Silane	40.5	160.0

Combined Hemp and Aspen Lignocellulose WT% (No Additives)



5 wt% Aspen

4 wt% aspen, 1 wt% hemp

3wt% aspen, 2 wt% hemp

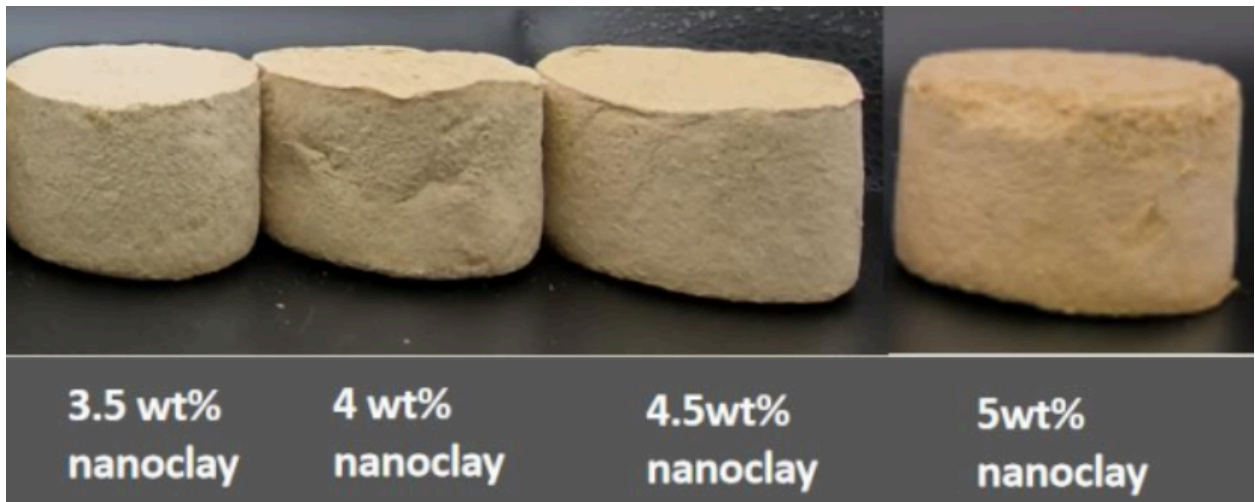
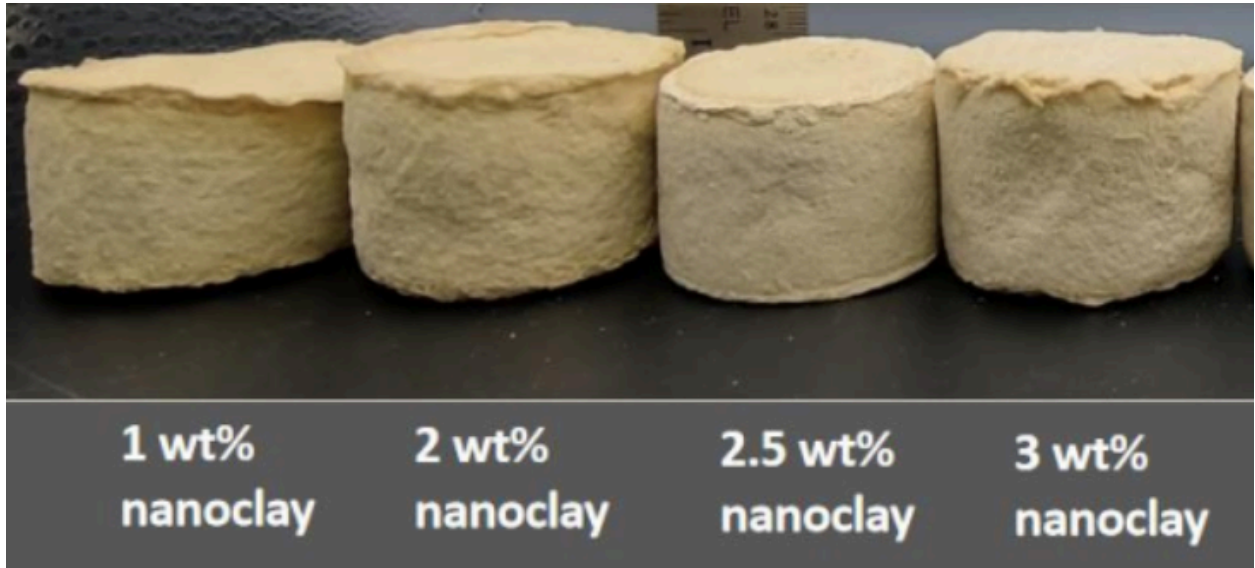


2 wt% Aspen, 3 wt% hemp

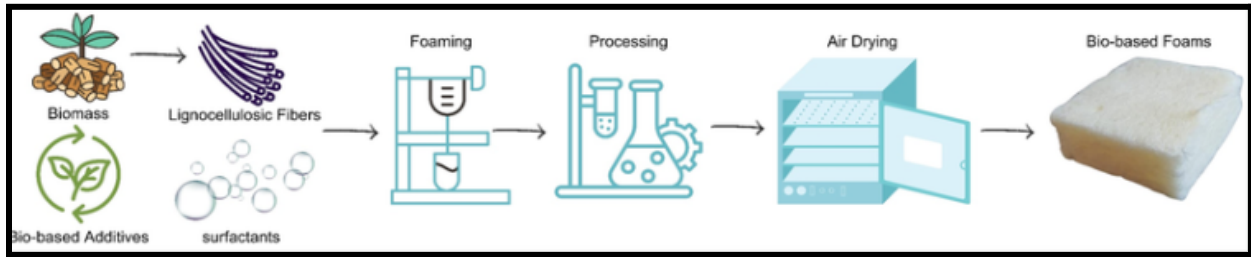
1 wt% Aspen, 4 wt% hemp

5 wt% hemp

## Manipulating WT% of Foam Additives



## Foam Fabrication Methodology



**Calculating Weight Percentage (wt%):** (how much solute makes up mass of total mixture)

$$\text{WEIGHT PERCENTAGE (WT\%)} = \frac{\text{MASS OF SOLUTE (G)}}{\text{TOTAL MASS OF SOLUTION (G)}} \times 100\%$$

**Innovative process used:** (followed for all foams, but only compositions were varied)

- 1) Preparation: added all necessary chemicals, additives, fibres, etc. to beaker whilst calculating appropriate wt%
- 2) Dispersion: used overhead stirrer for ~15-20 mins to fold in air and evenly homogenize components
- 3) Processing: added in crosslinker to turn into rigid foam
- 4) Air Drying: convert wet foam to dry foam