Sustainable Fire-Retardant, Thermal Insulating Biomass-Derived Foams for Green Buildings

Science Fair 2025-2026 Logbook

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Actual exhaustive logbook is in-person with dates, specific information, and recorded day-to-day entries. This is the full PDF of online work done for this project.

Articles, Websites, and Papers to Read:

Goal: Build economic understanding of foam insulation market + issues in current foams

https://pubs.acs.org/doi/10.1021/acssuschemeng.3c04108?fig=fig2&ref=pdf

https://www.sciencedirect.com/science/article/abs/pii/S1385894722037834

https://onlinelibrary.wiley.com/doi/full/10.1002/smll.202306942

https://www.tandfonline.com/doi/full/10.1080/01932691.2020.1869035

https://www.sciencedirect.com/science/article/abs/pii/S0001868615000603

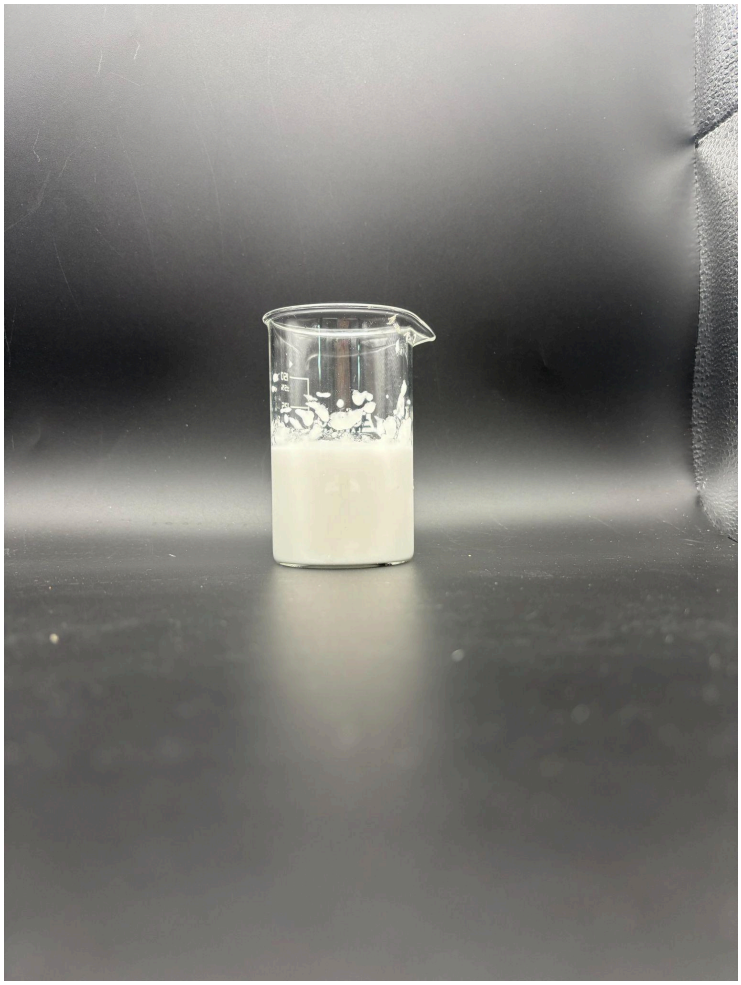
https://foamonline.com/foam-types/?srsltid=AfmBOooaojgnbdKrp0D3Qb6XKK8JdBuQFO-RAeoFeBtcIGjyrMNFrTS1

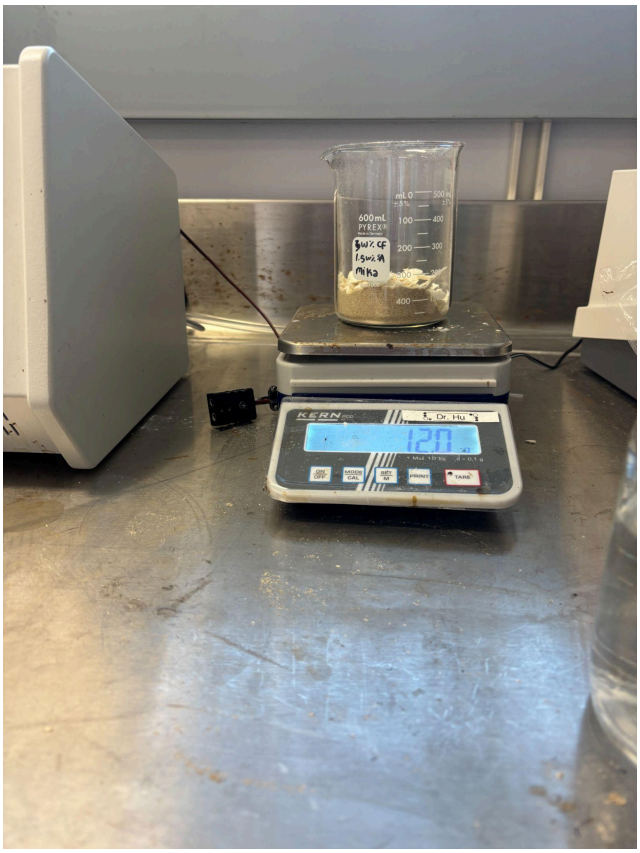
https://ozone.unep.org/system/files/documents/FTOC-Assessment-Report-2022.pdf

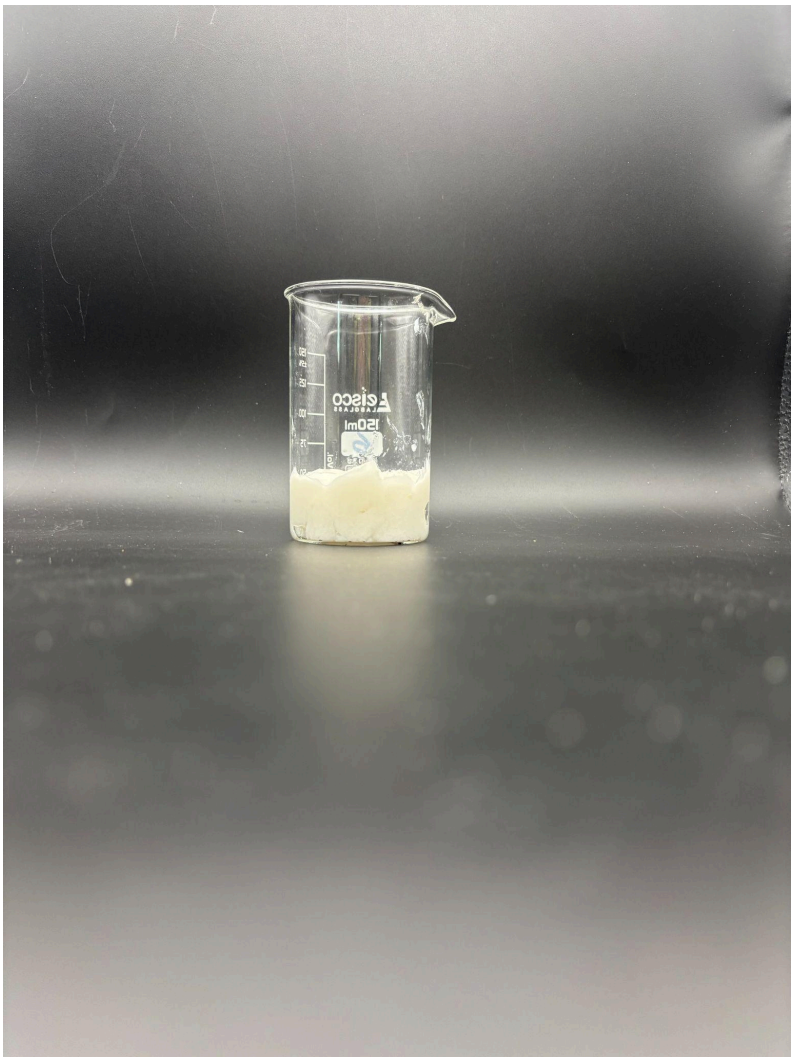
https://globalabc.org/sites/default/files/2024-11/global_status_report_buildings_construction_2023.pdf

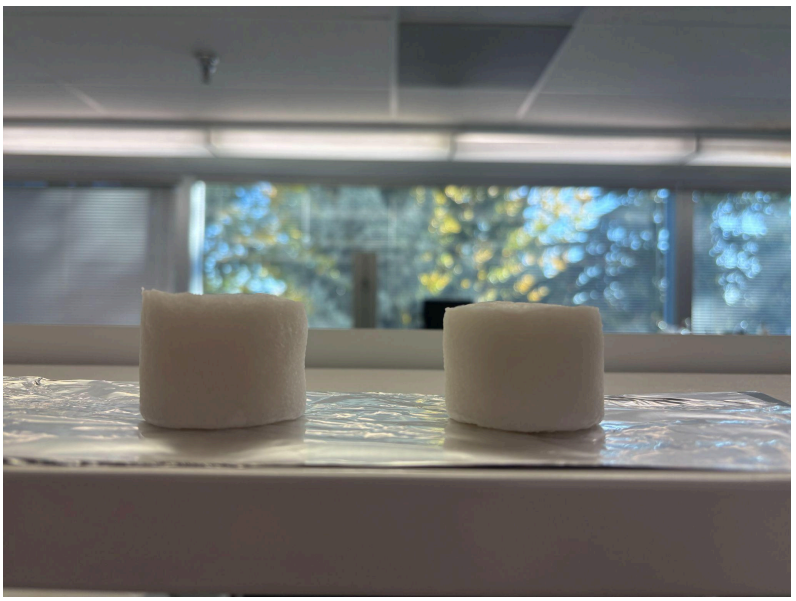
https://pubs.acs.org/doi/10.1021/acssuschemeng.3c04108?fig=fig2&ref=pdf

Project Photo Gallery




600mL
PYREX
KERN
121


Fisco
150ml



Timeline

Month	Goals	What was Done
July/August	☐ Decide on project topic → FIND SOMETHING I AM PASSIONATE ABOUT ☐ Start background research and get a good idea of what exactly I'm going to do	All goals
September	☐ Continue research ☐ Get things done on time by keeping track on paper logbook ☐ Get into flow → experimentation	All goals
October	☐ Continue research, experimentation ☐ Collect data	Researched, experimented, did not collect data
November	☐ Experimentation ☐ Collect data	Continued research, experimented, a lot of data collection
December	☐ Further experimentation/testing ☐ Data collection ☐ Start writing	All goals + took lots of pictures!
January	☐ Data Collection (writing) ☐ Results (writing) ☐ Analysis (writing) ☐ Conclusion (writing) ☐ Graph making ☐ Poster	Super busy, yet super exciting → was able to do all goals, even though data collection kind of ended in December → finished one panel of poster
February	☐ Finish writing portal (due March 3) ☐ Finish poster Version #1 for school science fair (March 2) ☐ Practice presentation	All goals
March	☐ Portal is due! Continue designing poster if needed	Accomplished

12-04-25

Make a plan for the model demonstration

- ☐ Read the papers and research the stimulation
- ☐ List of materials needed for the demonstration
- ☐ Start making the model

12-08-25

Dimensions of the model:

Foam: 2cm x 10cm length x width 10cm

Materials list:

- ☐ **Amazon Temperature Display**
- ☐ Plastic boards
    - ☐ They are closer to what is real than wood because wood is not susceptible to coldness, but walls are
    - ☐ Wood is not exactly walls
- ☐ Foams (make)
- ☐ Heat Source/Cold Source needed for stimulation

- For thickness of foam → thinner = better, but look into ideal thickness (look into papers)
- Look into ideas for the size and how they made it**
- Just as basic: proof of concept

Brainstorm which foams should have for model

- Compare and contrast (same composition of fibres)

12-11-25

- Figure out how big the model and how long the wood should be if the foam inside is 2 cm thick

01-05-25

- Bring the model box
- Handwarmers (go up to about 50 degrees celsius)
- Size: about the size of a palm (a bit longer)

01-15-26 week

- Will have foams ready for testing and foams used in houses too
- Attach and test
- Record the results

Figures for Poster

1) Mechanical strength – Qualitative, take photos with different foam types

2) Biodegradability (15-30 days)

3) Thermal conductivity images

4) Fire retardancy graphs/images

5) Building thermal management – picture of foam in model

6) Density and porosity

7) Illustrative figure