Seaweed salvage: Exploring the viability of non-native *Sargassum muticum* as a sustainable construction material

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Introduction

- *Sargassum muticum* is a brown macroalga non-native to the Pacific Northwest with the potential to disrupt ecosystem dynamics
- Sargassum's increasing abundance holds promise for potential utility as a sustainable building material
- This study investigates Sargassum's flammability characteristics as they compare to common insulation types

Image of researchers harvesting Sargassum samples from Alki Beach

METHODS

- Samples of S. muticum were collected from Alki Beach
- Samples were placed horizontally on a metal tray
- A stopwatch was prepared to accurately measure the time intervals to measure time to ignition and smoldering duration
- A gas torch was ignited and held approximately three inches from the sample at a horizontal angle
- Mass of samples before and after burning was compared
- Tests were conducted on fiberglass, cellulose, and sargassum

Photo of Sargassum samples that were collected in 5-gallon buckets

Probability of Ignition

- Sargassum had a lower probability of catching fire after 10 seconds of being exposed to open flame than cellulose or fiberglass.
- Sargassum is significantly less likely to catch fire within 10 seconds of being exposed to direct flame.

Duration of Burn

- Sargassum exhibited the longest smoldering time, which could be attributed to its organic nature and lack of chemical treatment.
- In contrast, fiberglass demonstrated no smoldering behavior, consistent with its fire-resistant properties.

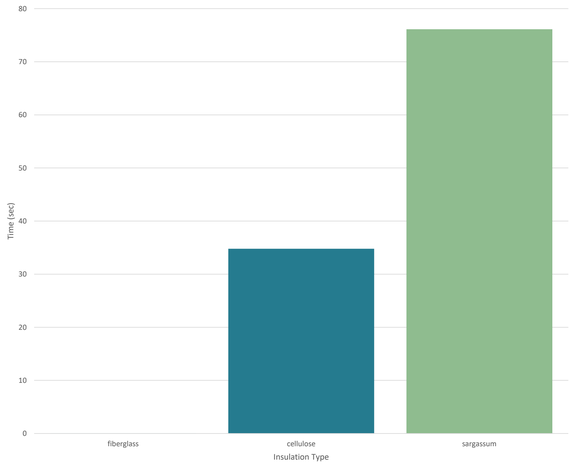


Figure 1. Duration of smoldering time subsequent to removal of flame after 10 seconds.

Mass Lost During Burn

- The linear regression analysis, considering both sample type and dry mass, indicated that differences in density did not significantly influence weight loss variations.
- The lack of significant differences in weight loss among the tested materials suggests that other factors, beyond density, might drive variations in combustion efficiency.

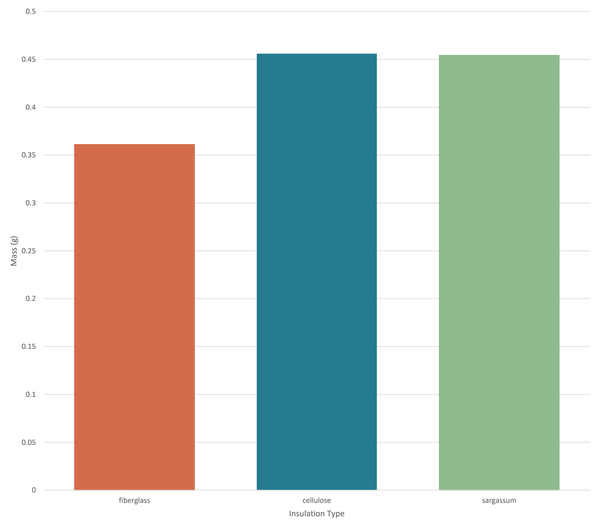
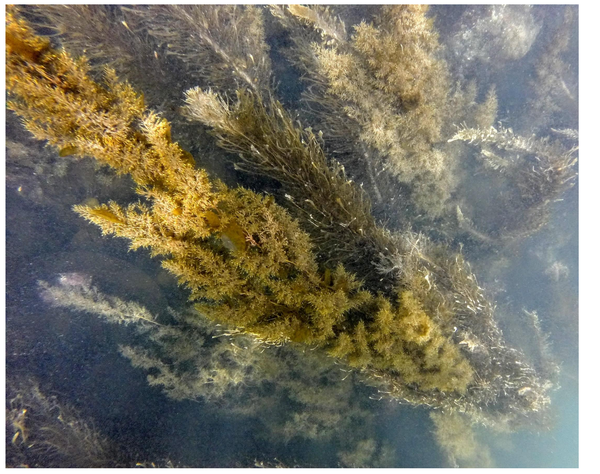


Figure 2. total mass lost during the duration of burning

Image of burn testing being conducted on a Sargassum sample

Discussion

The Sargassum had a lower probability of catching fire than other materials, which was unexpected as the Sargassum was not chemically treated with flame retardant. This may be attributed to a slightly higher moisture content in the Sargassum due to uneven drying (Bauta 2024; Borucka 2023). The longer duration of burn was expected as the Sargassum is an organic material that was untreated (Freivalde 2014).



Conclusion

The findings of this study have implications for using Sargassum as an insulation material, indicating a pathway toward sustainable construction practices. The study focused on specific testing conditions, such as a 10-second torch treatment, which might not fully represent real-world scenarios. Additionally, the study only considered untreated Sargassum in testing for flammability properties. Future research could explore a wider range of chemical treatments and burning conditions.

Citations

Bauta J, Vaca-Medina G, Delgado Raynaud C, Simon V, Vandenbossche V, Rouilly A. 2024. Development of a Binderless Particleboard from Brown Seaweed Sargassum spp. Materials (1996-1944). 17(3):539. doi:10.3390/ma17030539.
Borucka M, Mizera K, Przybysz J, Kozikowski P, Gajek A. 2023. Analysis of Flammability and Smoke Emission of Plastic Materials Used in Construction and Transport. Materials (1996-1944). 16(6):2444. doi:10.3390/ma16062444.
Freivalde L, Kukle S, Andžs M, Bukšāns E, Grāvītis J. 2014. Flammability of raw insulation materials made of hemp. Composites Part B: Engineering. 67:510–514. doi:10.1016/j.compositesb.2014.08.007.