

resulted in densities ranging from 80 to 200 kg/m³ depending on the

different types and amounts of additives used (surfactant, stabilizer, cross-linking agent) and the washing and drying methods

Foams with 2% beta chitin by weight exhibited compression elastic modulus' ranging from 3 to 8 MPa and yield strengths ranging from 0.2 to 0.46 MPa. These results match the mechanical properties of competing polyurethane foams at comparable densities. Foams made with 4% beta chitin by weight resulted in densities ranging from 700 to 800 kg/m³ and compression elastic moduli ranging from 100 to 175 MPa, and yield strengths ranging from 4.65 to 6.13 MPa.

One example of making a chitin based foam is as follows: A solution of 8% by weight sodium hydroxide and 4% by weight urea is dissolved in deionized water. After dissolving the NaOH and urea the solution is cooled to approximately 5° C. The NaOH/urea solution is placed at room temperature and 2% by weight beta chitin is added. The chitin is stirred into the solution and is then placed at -20 C for 24 to 48 hours.

Over the 24 to 48 hours the NaOH/urea/chitin solution is removed from the freezer and allowed to thaw to between 0° C and 5° C when the mixture becomes a viscous gel. The gel is stirred and again placed at -20 °C. This freeze/thaw/stir cycle is repeated an additional one to two times over the 24 to 48 hour period.

The solution is removed and allowed to thaw to between 0° C and 5° C when a surfactant, stabilizer, and/or cross-linker can be added to the solution. In this example the added surfactant is typically between 0.02% by weight to 1% by weight of the solution. The NaOH/urea/chitin gel with surfactant is mechanically foamed until a consistent liquid foamed state is achieved. The foam is then washed with water until all the excess NaOH and urea is removed and the wash reads close to a pH of 7. The foam is then transferred to a drying container or bed and allowed to air-dry or oven-dry.

APPLICATIONS

- ▶ Replacement for petroleum based (polystyrene) and/or corn based foam products
- ▶ Packaging
- ▶ Protection during shipping
- ▶ Coolers
- ▶ Surfboards

ADVANTAGES

- ▶ World's first 100% biodegradable and 100% bio-based foam made out of chitin.
- ▶ Low-cost manufacturing: inexpensive raw materials and cost-effective processing methods.
- ▶ Faster manufacturing process.
- ▶ Highly versatile - can be used in a range of products from packaging to surfboards

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,024,625	07/02/2024	2016-854
United States Of America	Issued Patent	11,667,770	06/06/2023	2016-854
Germany	Issued Patent	3487922	05/05/2021	2016-854
European Patent Office	Issued Patent	3487922	05/05/2021	2016-854
France	Issued Patent	3487922	05/05/2021	2016-854
United Kingdom	Issued Patent	3487922	05/05/2021	2016-854
United States Of America	Published Application	20250051554	02/13/2025	2016-854

Additional Patent Pending

RELATED MATERIALS

- ▶ [US20200239670 - Naturally Sourced Chitin Foam - 07/30/2020](#)

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Wearable Bioelectronics for Programmable Delivery of Therapy](#)
- ▶ [Bioelectronic Smart Bandage For Controlling Wound pH through Proton Delivery](#)

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