

POLYMER COMPOSITES 2025

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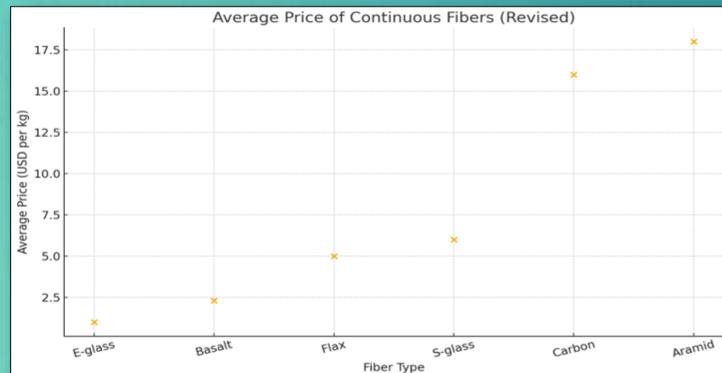
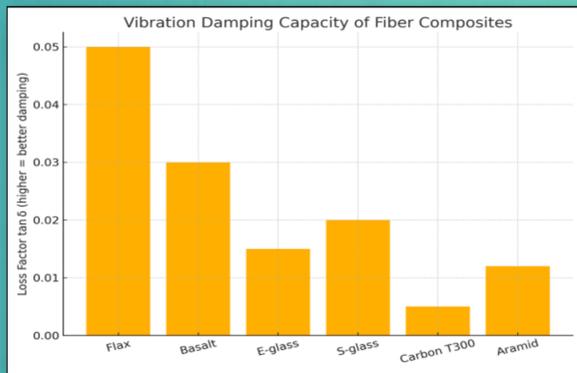
OEL COMPOSITES



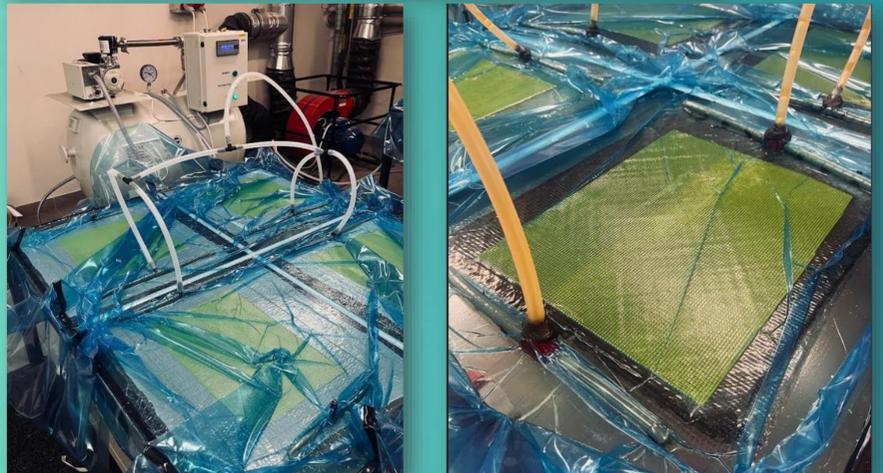
ANALYSIS OF THE POSSIBILITIES OF USING BASALT FABRICS AS AN ALTERNATIVE TO GLASS FABRICS

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Basalt fabrics, made from melted volcanic rock (basalt), are a promising alternative to commonly used glass fabrics in composite applications. Their production does not require the use of chemical additives, which makes them more environmentally friendly. Compared to glass fabrics, basalt fabrics are characterized by higher tensile strength (~4.5 GPa) and a higher modulus of elasticity (~90 GPa). Additionally, they are more resistant to high temperatures (up to approx. 800°C), UV radiation and chemically aggressive environments. Thanks to these properties, basalt fabrics are used in the construction of composites exposed to extreme operating conditions - in aviation, automotive, chemical industry and in civil engineering. Reinforcements made of basalt fibers (e.g. BFRP rods) are competitive with traditional materials due to their durability, corrosion resistance and lower environmental impact. Although the production cost of basalt fabrics is still higher than that of glass fabrics, technological developments and increased interest in sustainable materials indicate their growing importance in materials engineering.



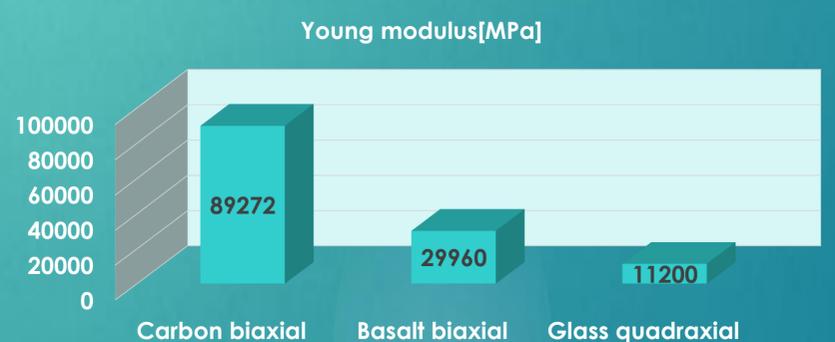
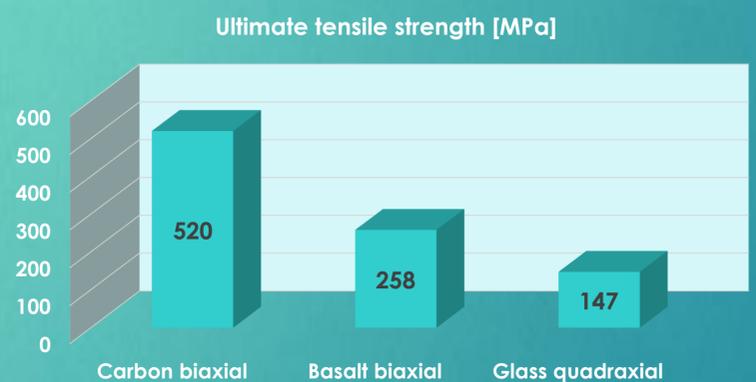
At the Faculty of Mechanical Engineering of the Maritime University in Gdynia, test samples were made using glass, carbon and basalt fabrics. Quadraxial glass fabric with a grammage of 625 g/m², biaxial carbon fabric with a grammage of 800 g/m², and biaxial basalt fabric with a grammage of 600 g/m² were used for the tests. Vinylester resin AME 6001 was used as the matrix, as well as Butanox M50 hardener. The vacuum infusion method was used to produce the samples.



Using the water cutting method, samples were prepared for static tensile testing in accordance with PN-EN 527-4. The tests were carried out on a Zwick Roell universal testing machine.

In order to develop the results and because the grammages of the fabrics were different, they were recalculated per layer, depending on the type of material (biaxial, quadraxial). This resulted in a summary of results showing the strength properties of the composites depending on the type of reinforcement.

	Ultimate tensile strength	Young modulus	Strain
	MPa	MPa	%
Carbon biaxial 2 layers	520	89272	0.88
Basalt biaxial 2 layers	258	29960	0.94
Glass quadraxial 2 layers	147	11200	1.15



The preliminary results of the conducted tests showed that in the case of using basalt fabric, the composite strength was almost twice as high as in the case of using glass fabric. The composite with basalt reinforcement (BFRP) was characterized by a Young's modulus value twice as high and a deformation value similar to the composite with carbon reinforcement (CFRP).

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