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Our reference: Inquiry e-mail of 28. January 2025.

Our reference: Quotation/Proforma Invoice 11047_29012025 for testing composite laminates.

Subject: Report on the Testing of Properties of Composites Reinforced with Glass and Aramid Fibers.

Based on your inquiry via email dated January 28, 2025, we conducted testing on composites reinforced with glass and aramid fibers.

The mechanical properties under bending and tensile loads, as well as the apparent interlayer shear strength, were evaluated using a Shimadzu universal testing machine with a measurement range of 0 – 50 kN. Bending tests were performed at a rate of 1 mm/min, while tensile tests and tests for apparent interlayer shear strength were conducted at a rate of 5 mm/min. One surface of the composite being tested was coated with a gray gel coat, while the opposite surface was reinforced with aramid fibers. During the testing of bending properties and apparent interlayer shear strength, the aramid fibers were in the tensile region, while the gel coat was in the compressive region.



Supervised for HRB by: Ognjen Grgorinić

Kaštelir, March 20, 2025.

Table 1 - Overview of Properties Covered by Tests.

	Property	Unit	Standard
1.	Bending Strength	MPa	HRN EN ISO 14125
2.	Modulus of Elasticity in Bending Load	MPa	HRN EN ISO 14125
3.	Tensile Strength	MPa	HRN EN 527-4
4.	Modulus of Elasticity in Tensile Load	MPa	HRN EN 527-4
5.	Apparent Interlayer Shear Strength	MPa	EN ISO 14130
6.	Mass Fraction of Fibers	%	EN ISO 1172

Test results are presented in Tables 2-5.

Table 2 - Test Results for Properties Under Bending Load

Test Specimen	b, mm	h, mm	Bending Strength, MPa	Modulus of Elasticiy in Bending, MPa
1	30,38	12,28	375,65	15338
2	30,18	12,32	403,14	15843
3	29,96	12,42	388,52	15303
4	29,54	12,38	369,99	15153
5	29,62	12,26	373,66	14501
Average Value	**29,94**	**12,33**	**382,19**	**15228**
Standard Deviation	**0,36**	**0,07**	**13,63**	**482**

Table 3 - Test Results for Properties Under Tensile Load

Test Specimen	b, mm	h, mm	Tensile Strength MPa	Modulus of Elasticity in Tensile Load MPa
1	15,08	12,54	250,70	13126
2	15,02	12,34	264,19	13545
3	14,72	12,28	276,67	12914
4	14,84	12,32	273,57	12336
Average Value	**14,92**	**12,37**	**266,28**	**12980**
Standard Deviation	**0,17**	**0,12**	**11,66**	**503**

Table 4 - Test Results for Apparent Interlayer Shear Strength

Test Specimen	b, mm	h, mm	Interlayer Shear Strength MPa
1	61,70	12,56	27,49
2	61,18	12,34	29,28
3	60,28	12,28	26,03
4	61,66	12,40	24,15
5	60,80	12,22	30,41
Average Value	**61,12**	**12,36**	**27,47**
Standard Deviation	**0,60**	**0,13**	**2,50**

Table 5 - Test Results for Mass Fraction

Test Specimen	Mass Fraction,%
1	68,57
2	68,68
3	68,89
4	68,75
Average Value	**68,72**
Standard	**0,13**

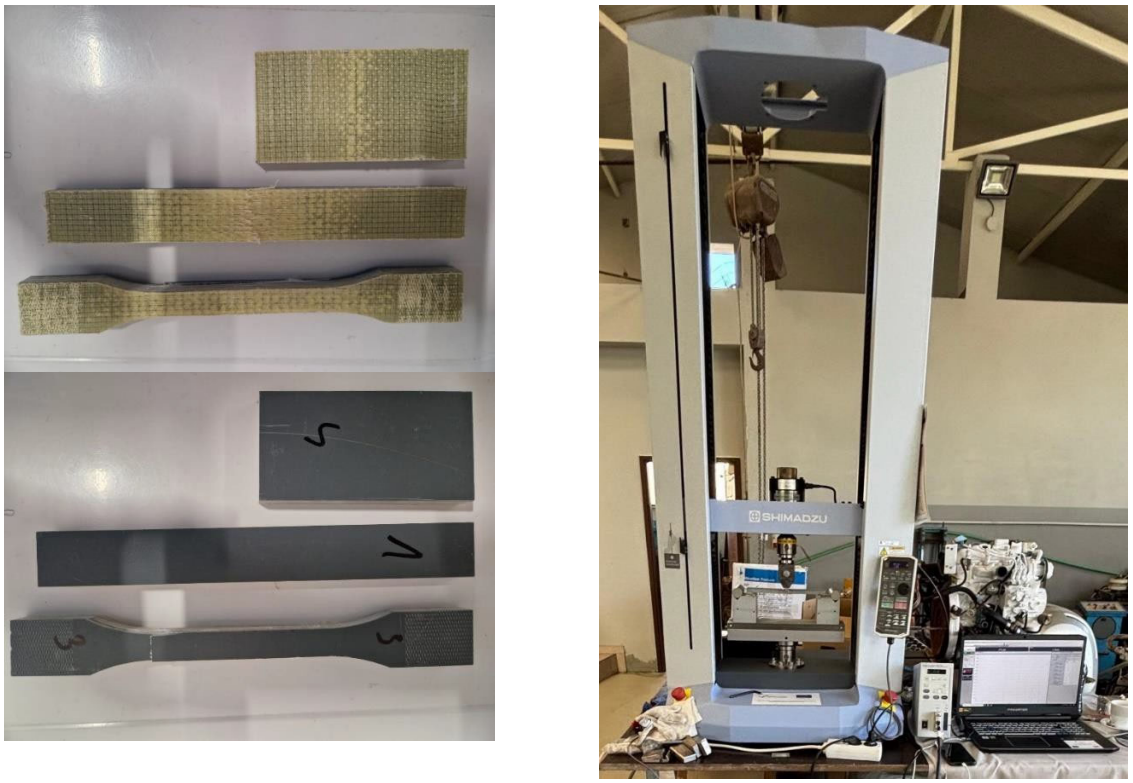


Foto 1 – Test specimens for tensile and bending testing, as well as apparent interlayer shear strength, two surfaces, after testing (left) and bending testing on the testing machine (right).

We look forward to further cooperation and send our best regards.

In Zagreb, 28.March 2025.

Head of the Polymer and Composite Laboratory:

Prof. dr. sc. Tatjana Haramina

Head of the Polymer and Composite Laboratory:

Prof. dr. sc. Krešimir Grilec