GLASS FABRICS AS REINFORCEMENT FOR COMPOSITE PLATES

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Apstract

The aim of this study was to investigate the possibilities of utilization of the different glass fabrics and matrices for production of the composite plates. The thermosetting matrices was used for production of the prepreg from the fabrics. The reinforcement material was impregnated with matrix to perform a prepreg and with this process a complete wetting of fibers with the matrix. Basic parameters of the process for prepreg production like as content of matrix, uniformity of matrix along overall surface of reinforcement, gel time, matrix flow, moisture content and volatiles materials were tested.

The basic mechanical and physical properties of the composite plates were investigated. The laminated composite structures have wide application in aerospace, mechanical, civil and other areas of engineering chiefly due to the low value of specific weight and high values of specific strength and specific stiffness.

1. MATERIALS

Matrix

1. epoxy resin system
2. PVB/phenol

Reinforcement

1. glass fabric 100 gr/m2
2. glass fabric 300gr/m2

2. PRODUCTION OF PREPREGS

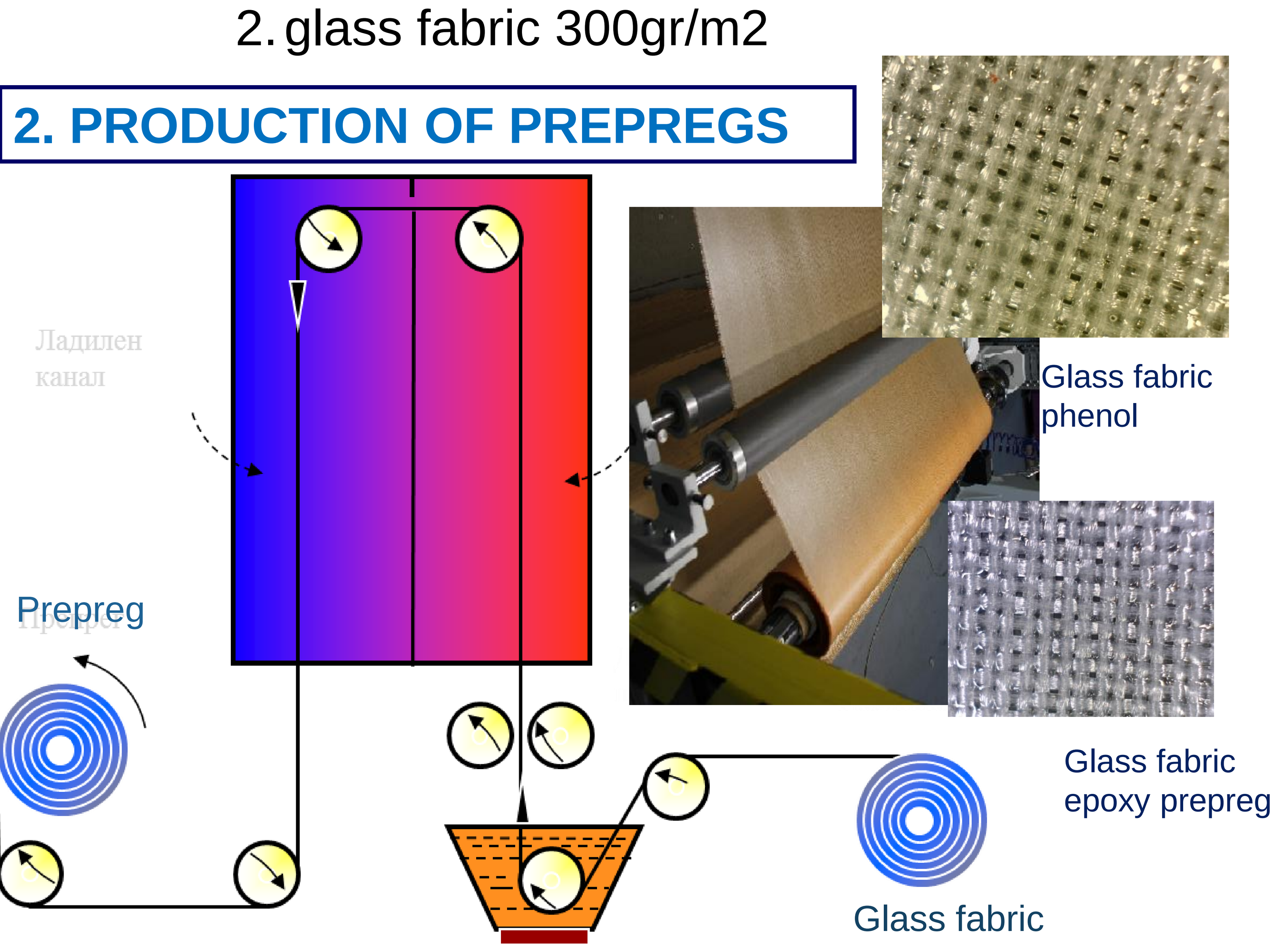

Fig 1. Production of prepregs

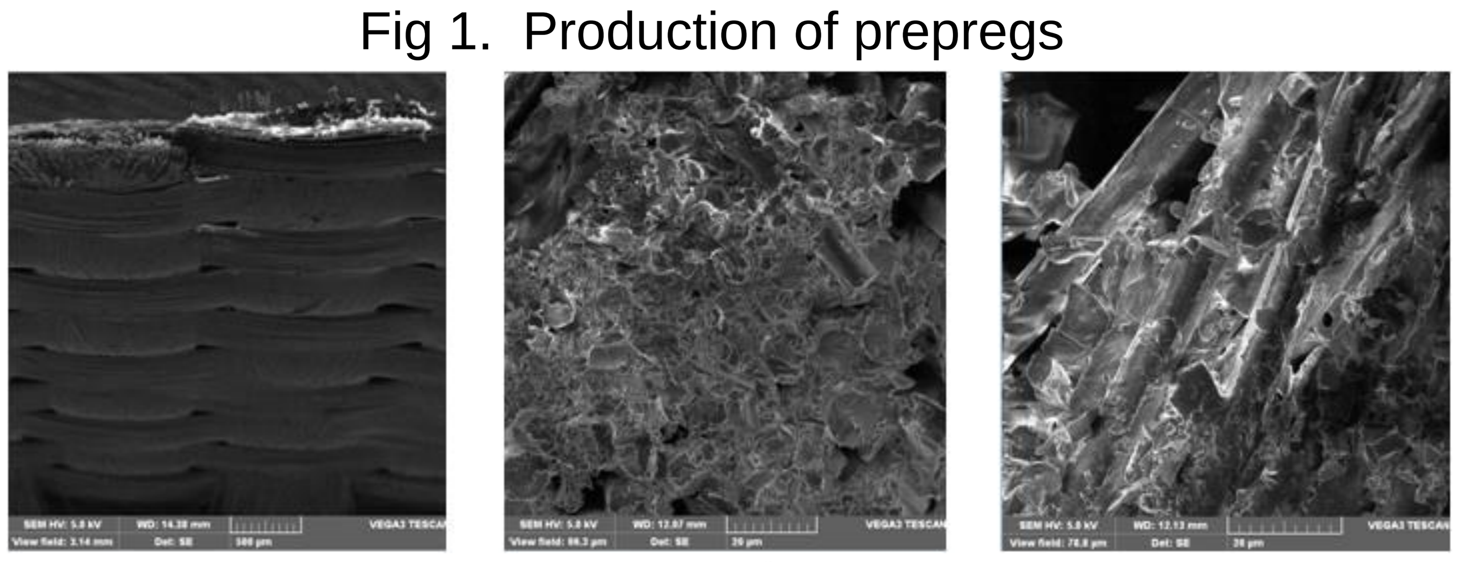

Fig 2. SEM of prepregs

3. PREPARED SAMPLES (composite plate)

The composite plates were fabricated from the prepreg materials by thermo -compression in an open mold on a semi - industrial press machine.

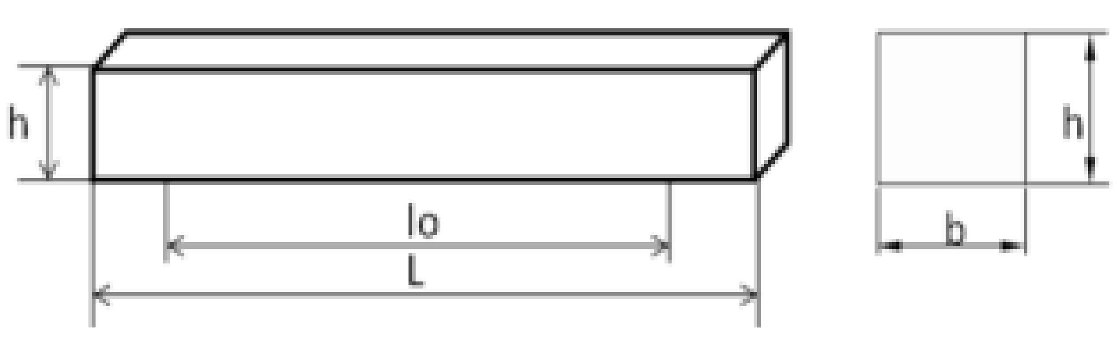

Fig 3. Geometry of three-point bending specimens

A composite laminate is a structural plate consisting of multiple layers of fiber reinforcement encased in curved resin.

4. THREE POINT BENDING TESTS

Three point bending tests were conducted on servo-hydraulic testing machine. During testing central loading rate with 5 mm/min was applied.

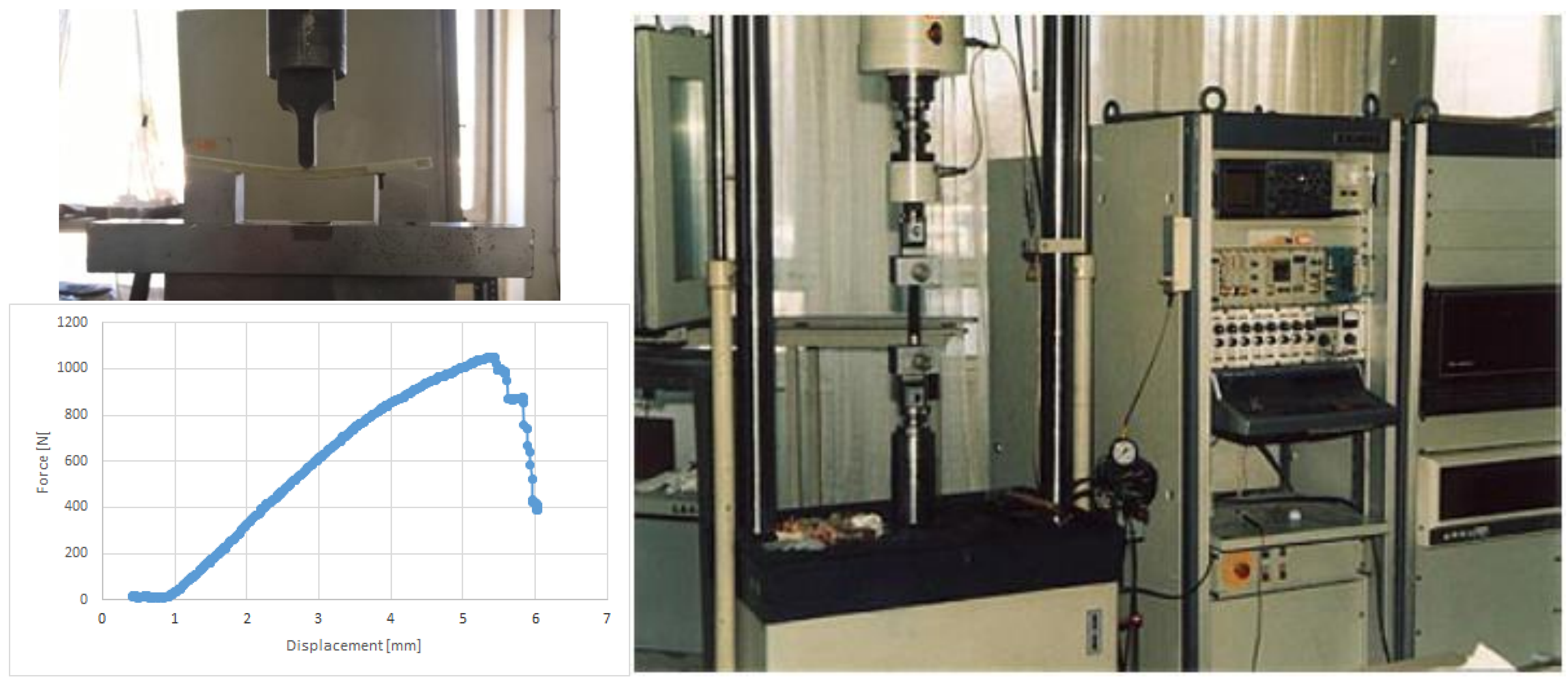

Fig 4. Force-deflection diagram of sample

The flexural stress, σ f in the outer surface of the test specimens occurred at the midpoint. These stresses were determined from the relationship:

$$\sigma_f = \frac{3FL}{2bh^2}$$

5. EXPERIMENTAL RESULTS FROM BENDING TESTS

Glass fabric / epoxy resin									
Specimens		No	length l	Width w	Depth d	Load P (max)	Span L	Maximum Flexural Strength	Average Flexural Strength,
direction	fabric	No.	(mm)	(mm)	(mm)	(N)	(mm)	σf (Mpa)	Mpa
II	2	1	119,67	15,99	4,39	1466	70	499,512	474,899
		2	119,66	16	4,36	1345	70	464,321	
		3	120,14	16,11	4,35	1338	70	460,862	
I	2	1	119,6	15,04	4,48	982	70	341,584	344,442
		2	119,27	16,06	4,35	933	70	322,364	
		3	119,18	16,09	4,36	1076	70	369,379	
II	1	1	60,12	15,88	2,22	646	32	396,203	383,504
		2	60,22	15,89	2,27	679	32	398,048	
		3	60,09	15,88	2,26	602	32	356,263	
I	1	1	60,93	15,92	2,3	572	32	326,016	339,523
		2	60,88	16,03	2,18	520	32	327,641	
		3	60,78	15,77	2,19	575	32	364,913	

Glass fabric / phenol resin									
Specimens		No	length l	Width w	Depth d	Load P (max)	Span L	Maximum Flexural Strength	Average Flexural Strength,
direction	fabric	No.	(mm)	(mm)	(mm)	(N)	(mm)	σf (Mpa)	Mpa
II	2	1	120	16	4,39	1255	70	427,350	422,492
		2	120	16	4,36	1224	70	422,550	
		3	120	16,11	4,41	1246	70	417,575	

I CD direction; II MD direction; 1 -100gr/m2 fabric; 2-300 gr/m2 with epoxy and phenol resin matrix

6. CONCLUION

The purpose of this paper is to choose proper combination of temperature/reinforcement/ matrix for production of laminate that will have high flexure stress.

Bending properties of composite plates have been determined with experimental methods, where good compatibility in bending strength was achieved. From received results can be concluded that highest bending strength have demonstrated sample II,2 glass fabric/ epoxy followed by sample II,2 glass fabric/ phenol.