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APPENDIXES

APPENDIX A

Raw Data of Mechanical Properties

The tensile strength, tensile modulus, compressive strength, compressive modulus, flexural strength and flexural modulus were determined by Instron Universal Testing Machine Model 4200-006 and the impact strength was measured by Zwick/materialprufung Impact Testing Machine.

Sample Identification:

Sample code = XY-Z

where

X = the length of fiber or percent of fiber loading,
Y = fiber treatment or varing percent of fiber,
Z = test types.

Meaning of code:

X	Identification
1	1 cm
5	5 cm
10	10 cm
O/C	ordinary /continuous or
10	10 %
30	30 %
40	40 %
50	50 %

Y	identification
PUP	pure UP resin
NT	untreated
T2	2%-treated
T5	5%-treated
T8	8%-treated
GF	glass fiber
or	
VP	vary percent of fiber

Z	identification
T	tensile test
C	compressive tset
F	flexural test
I	impact test

such as,

10T5-T

It means that 5%-treated coir fiber, 10 cm coir fiber length and 20% coir fiber loading were used to fabricate the composites.

and

30VP-F

It means that 8%-treated coir fiber, 1 cm coir fiber length and 30% coir fiber loading were used to fabricate the composites.

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: PUP-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	10.50	10.85	10.75	10.55
Thickness (mm)	2.80	2.85	2.75	2.80
Ext. gauge len (mm)	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (MainYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	20.36	0.6671	20.36	0.6671	20.36	0.6671	2935	0.1012	0.0688
2	19.82	0.6666	20.07	0.6760	19.82	0.6671	3107	0.1066	0.0690
3	20.94	0.6156	21.36	0.6156	20.93	0.6226	3269	0.1003	0.0678
4	25.93	0.7886	25.93	0.7886	25.85	0.7858	3242	0.1606	0.1087
Mean:	21.76	0.6845	21.93	0.6868	21.74	0.6857	3138	0.1172	0.0786
Standard Deviation:	2.82	0.0735	2.72	0.0729	2.78	0.0700	153	0.0291	0.0201

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: INT-T
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	10.00	10.75	10.45	9.15
Thickness (mm)	3.00	3.00	2.95	2.95
Ext. gauge len (mm)	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	32.05	1.0320	32.05	1.0320	31.59	1.0370	3225	0.2694	0.1796
2	35.40	1.1050	11.88	2.3080	34.74	1.1240	3402	0.6880	0.4267
3	28.02	0.7876	28.02	0.7876	28.02	0.7876	3589	0.1807	0.1172
4	28.71	1.8020	28.98	1.8410	28.80	1.8260	3457	0.1860	0.1378
Mean:	31.04	1.1817	ERR	1.4921	30.79	1.1937	3418	0.3310	0.2153
Standard Deviation:	3.40	0.4353	ERR	0.7060	3.05	0.4450	151	0.2414	0.1433

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: SHT-T
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	9.70	10.70	10.50	10.50	10.45
Thickness (mm)	2.85	2.95	2.90	2.90	2.95
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	25.76	0.7437	25.76	0.7437	25.54	0.7366	3514	0.1339	0.0969
2	38.44	1.0450	13.18	2.3370	37.38	1.0130	3908	0.6695	0.4242
3	38.90	1.3340	38.90	1.3340	38.78	1.3360	2894	0.4126	0.2710
4	37.04	1.2700	37.04	1.2700	36.94	1.2660	2810	0.4129	0.2712
5	38.09	1.0890	38.09	1.0890	37.87	1.0820	3422	0.3380	0.2193
Mean:	35.65	1.0963	30.59	1.3547	35.30	1.0867	3310	0.3934	0.2565
Standard Deviation:	5.57	0.2311	11.11	0.5951	5.50	0.2357	457	0.1920	0.1177

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 10MT-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.05	10.70	10.50	10.00	9.45
Thickness (mm)	2.75	2.95	3.00	2.85	2.90
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	28.73	0.8348	28.73	0.8348	28.66	0.8324	3166	0.1751	0.1267
2	28.43	0.9578	28.43	0.9578	28.25	0.9514	2874	0.2274	0.1441
3	28.30	0.8321	17.50	1.4010	28.30	0.8324	3347	0.3898	0.2475
4	32.13	0.9324	19.73	3.1230	32.13	0.9324	3526	1.2620	0.8859
5	27.54	0.7867	27.54	0.7867	27.27	0.7795	3251	0.1543	0.1126
Mean:	29.03	0.8688	24.39	1.4207	28.92	0.8656	3233	0.4417	0.3034
Standard Deviation:	1.79	0.0728	5.34	0.9820	1.87	0.0732	241	0.4677	0.3299

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing Systen 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: ONT-T

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2
Width (mm)	9.65	10.05
Thickness (mm)	2.95	2.80
Ext. gauge len (mm)	50.00	50.00
Spec. gauge len (mm)	115.00	115.00

Out of 2 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	33.09	0.9889	33.09	0.9889	33.78	1.0660	3524	0.3056	0.2147
2	31.11	1.0910	31.11	1.0910	31.09	1.0890	3865	0.2581	0.1834
Mean:	32.10	1.0400	32.10	1.0400	32.44	1.0775	3695	0.2819	0.1991
Standard Deviation:	1.40	0.0571	1.40	0.0722	1.90	0.0163	241	0.0336	0.0221

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 1T2-T
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec. 3
Width (mm)	10.00	9.85	9.10
Thickness (mm)	3.00	3.00	3.00
Ext. gauge len (mm)	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00

Out of 3 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	32.97	0.9254	10.99	7.7920	32.97	0.9254	2935	2.1130	1.4090
2	31.88	0.9240	31.88	0.9240	31.88	0.9240	3186	0.2399	0.1623
3	32.55	0.9567	32.55	0.9567	31.61	0.9240	3282	0.2260	0.1656
Mean:	32.47	0.9354	25.14	3.2242	32.15	0.9245	3134	0.8596	0.5790
Standard Deviation:	0.55	0.0185	12.26	3.9557	0.72	0.0008	179	1.0854	0.7188

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: ST2-T

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	10.60	9.65	10.45	10.70
Thickness (mm)	2.85	3.00	3.00	2.90
Ext. gauge len (mm)	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	35.16	1.1990	35.16	1.1990	34.47	1.1660	3345	0.3447	0.2282
2	35.14	1.1820	15.84	9.1240	34.92	1.1660	3256	3.1670	2.1880
3	32.41	1.0470	32.41	1.0470	32.41	1.0470	3507	0.2774	0.1770
4	32.88	1.1310	13.15	5.9220	32.78	1.1400	3621	1.9220	1.2390
Mean:	33.90	1.1398	24.14	4.3230	33.65	1.1298	3432	1.4278	0.9581
Standard Deviation:	1.46	0.0683	11.25	3.9199	1.24	0.0565	163	1.3863	0.9547

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 10T2-T
Interface Type: 4200 Series

Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.00	10.60	9.65	9.90	10.30
Thickness (mm)	2.90	2.85	2.85	2.95	2.85
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	32.87	1.0930	18.53	2.4330	32.71	1.0960	3628	0.6776	0.4673
2	32.30	0.8871	32.30	0.8871	32.00	0.8950	3507	0.2321	0.1537
3	33.39	0.2645	11.70	2.1420	33.29	0.2682	3795	0.6896	0.5015
4	31.29	1.0060	31.29	1.0060	31.24	1.0070	3009	0.2494	0.1708
5	33.76	0.9236	33.76	0.9236	33.57	0.9174	4706	0.2372	0.1616
Mean:	32.72	0.8348	25.52	1.4783	32.56	0.8367	3729	0.4172	0.2910
Standard Deviation:	0.97	0.3286	9.84	0.7470	0.95	0.3276	620	0.2433	0.1771

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: OT2-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	9.95	9.75	10.25	9.60
Thickness (mm)	2.85	2.80	2.90	2.80
Ext. gauge len (mm)	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	35.24	1.0070	13.73	2.7200	34.37	1.0320	3444	0.7064	0.4982
2	35.20	1.4770	18.20	7.2090	35.19	1.4750	2960	2.2860	1.6750
3	34.32	1.0250	12.41	5.8420	34.32	1.0320	3381	2.2040	1.4830
4	36.20	1.2070	36.20	1.2070	35.77	1.1800	3378	0.3353	0.2495
Mean:	35.24	1.1790	ERR	4.2445	34.91	1.1798	3291	1.3829	0.9764
Standard Deviation:	0.77	0.2182	ERR	2.7623	0.70	0.2088	223	1.0075	0.7075

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: IT5-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.45	10.00	9.95	10.65	10.00
Thickness (mm)	2.80	2.75	2.75	2.80	2.85
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	36.83	1.5040	36.83	1.5040	36.43	1.4890	3875	0.3025	0.2068
2	37.21	1.0060	13.95	9.5060	37.21	1.0540	3884	2.8930	2.1040
3	34.04	0.8941	34.04	0.8941	33.52	0.9299	3889	0.2236	0.1635
4	34.76	0.7718	34.76	0.7718	33.94	0.7437	3868	0.2451	0.1644
5	38.95	0.9952	38.95	0.9952	38.85	0.9920	3871	0.2918	0.2048
Mean:	36.36	1.0342	31.71	2.7342	35.99	1.0417	3877	0.7912	0.5687
Standard Deviation:	1.97	0.2791	10.11	3.7957	2.25	0.2757	9	1.1754	0.8585

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: 5T5-T

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	9.95	10.50	10.75	10.20	10.30
Thickness (mm)	2.65	2.90	2.55	2.75	2.60
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	36.34	0.9579	36.34	0.9579	36.32	0.9576	3868	0.2495	0.1892
2	34.00	0.8764	34.00	0.8764	34.00	0.8764	3865	0.2412	0.1584
3	35.36	0.9192	16.84	3.1350	34.51	0.9830	3868	0.9550	0.6967
4	36.54	0.9240	12.60	3.5590	36.54	0.9240	3888	2.2200	1.5830
5	37.85	1.6630	13.32	9.1140	37.85	1.6700	3890	3.2010	2.3910
Mean:	36.02	1.0681	22.62	3.5285	35.84	1.0822	3876	1.3733	1.0037
Standard Deviation:	1.44	0.3338	11.60	3.3538	1.57	0.3310	12	1.3016	0.9659

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 1075-7
Interface Type: 4200 Series

Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.00	10.55	10.95	10.30	10.10
Thickness (mm)	2.60	2.60	2.65	2.85	2.85
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	34.99	0.9748	34.99	0.9748	33.92	0.9183	3880	0.2405	0.1850
2	37.27	0.9301	37.27	0.9301	36.95	0.9183	3863	0.2600	0.1896
3	36.22	1.0040	36.22	1.0040	36.05	0.9982	3864	0.2824	0.1946
4	36.45	1.0730	13.89	3.8320	36.45	1.0780	3887	1.1960	0.8146
5	38.84	1.3290	32.43	2.3550	38.72	1.3180	3886	1.0370	0.7203
Mean:	36.75	1.0622	30.96	1.8192	36.42	1.0462	3876	0.6032	0.4208
Standard Deviation:	1.42	0.1579	9.71	1.2754	1.73	0.1658	12	0.4722	0.3182

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: OT5-T

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.40	10.40	10.50	11.15	10.50
Thickness (mm)	2.85	2.90	2.65	2.75	2.70
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	36.90	0.9169	36.90	0.9169	36.58	0.9078	3880	0.2697	0.1820
2	35.62	0.8851	35.62	0.8851	34.64	0.8876	3860	0.2538	0.1683
3	34.40	1.0410	34.40	1.0410	34.11	1.0490	3864	0.2584	0.1857
4	37.20	1.0670	37.20	1.0670	37.08	1.0690	3872	0.2994	0.1953
5	36.61	0.7443	36.61	0.7443	36.55	0.7464	3896	0.2434	0.1717
Mean:	36.15	0.9309	36.15	0.9309	35.79	0.9320	3874	0.2649	0.1806
Standard Deviation:	1.14	0.1301	1.14	0.1301	1.32	0.1318	14	0.0215	0.0109

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: OT5-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.40	10.40	10.50	11.15	10.50
Thickness (mm)	2.85	2.90	2.65	2.75	2.70
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	36.90	0.9169	36.90	0.9169	36.58	0.9078	3880	0.2697	0.1820
2	35.62	0.8851	35.62	0.8851	34.64	0.8876	3860	0.2538	0.1683
3	34.40	1.0410	34.40	1.0410	34.11	1.0490	3864	0.2584	0.1857
4	37.20	1.0670	37.20	1.0670	37.08	1.0690	3872	0.2994	0.1953
5	36.61	0.7443	36.61	0.7443	36.55	0.7464	3896	0.2434	0.1717
Mean:	36.15	0.9309	36.15	0.9309	35.79	0.9320	3874	0.2649	0.1806
Standard Deviation:	1.14	0.1301	1.14	0.1301	1.32	0.1318	14	0.0215	0.0109

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing Systen 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: IT8-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.45	10.10	10.65	9.95	10.10
Thickness (mm)	2.80	3.00	2.80	2.80	2.75
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	34.56	0.9245	34.56	0.9245	34.55	0.9240	3887	0.2433	0.1663
2	36.56	1.0230	36.56	1.0230	36.52	1.0220	3861	0.2840	0.1875
3	33.92	1.0120	33.92	1.0120	33.54	1.0020	3873	0.2343	0.1571
4	35.38	0.9390	35.38	0.9390	34.79	0.9404	3883	0.2501	0.1795
5	36.51	0.8187	36.51	0.8187	36.31	0.8126	3892	0.2487	0.1791
Mean:	35.39	0.9434	35.39	0.9434	35.14	0.9402	3879	0.2521	0.1739
Standard Deviation:	1.17	0.0821	1.17	0.0821	1.26	0.0822	12	0.0189	0.0121

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: 578-T

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	9.90	10.25	10.20	10.05	10.30
Thickness (mm)	3.00	3.00	3.00	3.00	3.00
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	35.82	0.9632	35.82	0.9632	34.67	0.9298	3902	0.2658	0.1790
2	36.84	1.1560	12.44	2.2330	36.63	1.1730	3919	0.7452	0.4847
3	37.28	1.0490	37.28	1.0490	37.04	1.0510	3899	0.3036	0.1984
4	37.65	0.9731	12.73	2.4440	36.65	1.0110	3900	0.7274	0.4825
5	33.54	1.0530	33.54	1.0530	33.47	1.0510	3882	0.2805	0.1815
Mean:	36.23	1.0389	26.36	1.5484	35.69	1.0432	3900	0.4645	0.3052
Standard Deviation:	1.65	0.0776	12.65	0.7259	1.55	0.0878	13	0.2486	0.1630

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 10T8-T
Interface Type: 4200 Series
Machine Parameters of test:

Sample Type: ASTM

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	9.60	10.00	9.95	10.30	9.75
Thickness (mm)	2.85	2.95	2.90	2.90	2.90
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	37.68	1.1930	13.14	2.3030	37.21	1.1750	3910	0.5496	0.4018
2	34.80	0.9659	34.80	0.9659	34.63	0.9612	3899	0.2545	0.1726
3	36.42	1.1660	36.42	1.1660	36.14	1.1750	3892	0.4188	0.2903
4	37.52	1.3660	12.51	4.7300	37.01	1.3350	3896	1.2620	0.8447
5	35.94	0.9866	35.94	0.9866	35.94	0.9866	3908	0.2521	0.1783
Mean:	36.47	1.1355	26.56	2.0303	36.19	1.1266	3901	0.5474	0.3775
Standard Deviation:	1.19	0.1645	12.56	1.6071	1.03	0.1542	8	0.4184	0.2775

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: OT8-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.10	10.10	9.85	10.00	9.95
Thickness (mm)	2.95	2.95	3.00	2.95	2.95
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	35.94	0.9549	35.94	0.9549	35.64	0.9454	3908	0.2670	0.1792
2	36.58	0.9676	36.58	0.9676	36.33	0.9740	3913	0.2618	0.1757
3	34.81	0.9528	34.81	0.9528	34.02	0.9597	3889	0.2593	0.1755
4	35.29	0.9002	35.29	0.9002	35.18	0.9024	3885	0.2421	0.1641
5	35.81	0.9603	35.81	0.9603	35.80	0.9597	3908	0.2685	0.1829
Mean:	35.69	0.9472	35.69	0.9472	35.39	0.9482	3901	0.2597	0.1755
Standard Deviation:	0.67	0.0269	0.67	0.0269	0.87	0.0275	13	0.0105	0.0070

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 1GF-T
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.30	10.20	10.20	10.85	10.55
Thickness (mm)	2.90	2.80	2.85	2.70	2.70
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	42.53	0.5141	42.25	0.5960	49.73	0.5748	8511	0.2809	0.1881
2	39.95	0.6510	39.95	0.6510	47.48	0.5937	8213	0.2283	0.1598
3	53.39	0.7745	53.39	0.7745	54.75	0.7445	8416	0.5139	0.3535
4	53.19	0.6932	53.19	0.6932	52.57	0.7257	8405	0.2682	0.1831
5	34.78	0.6268	34.78	0.6268	48.46	0.6125	7960	0.2558	0.1796
Mean:	44.77	0.6519	44.71	0.6683	50.60	0.6502	8301	0.3094	0.2128
Standard Deviation:	8.26	0.0953	8.28	0.0692	3.01	0.0789	219	0.1159	0.0794

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: SGP-T
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec. 3
Width (mm)	10.00	10.85	10.75
Thickness (mm)	2.80	2.90	2.80
Ext. gauge len (mm)	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00

Out of 3 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	51.48	0.5705	51.48	0.5705	51.37	0.5716	9900	0.2181	0.1558
2	56.81	0.6385	56.81	0.6385	56.74	0.6399	9797	0.3247	0.2064
3	49.80	0.4819	49.80	0.4819	48.67	0.4733	9963	0.1875	0.1246
Mean:	52.70	0.5636	52.70	0.5636	52.26	0.5616	9887	0.2434	0.1623
Standard Deviation:	3.66	0.0785	3.66	0.0785	4.11	0.0837	84	0.0720	0.0413

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 10GF-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	11.00	11.10	11.20	10.40	10.70
Thickness (mm)	2.85	2.85	2.85	2.90	2.80
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	51.03	0.5799	51.03	0.5799	50.83	0.5776	11160	0.2332	0.1487
2	50.49	0.4705	50.49	0.4705	49.03	0.4584	11000	0.1901	0.1202
3	45.54	0.6693	45.54	0.6693	45.24	0.6992	11020	0.2003	0.1255
4	57.66	0.5551	57.66	0.5551	56.36	0.5431	11000	0.2420	0.1605
5	42.53	0.4477	42.53	0.4477	42.46	0.4468	11000	0.1526	0.1019
Mean:	49.45	0.5445	49.45	0.5445	48.78	0.5450	11036	0.2036	0.1314
Standard Deviation:	5.79	0.0891	5.79	0.0891	5.34	0.1025	70	0.0359	0.0233

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: CGP-T

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.65	10.25	10.25	10.00	9.65
Thickness (mm)	2.75	2.80	2.85	2.95	2.80
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	57.41	0.8429	57.41	0.8429	57.41	0.8844	11100	0.4497	0.3071
2	56.94	0.5831	23.29	0.4121	56.94	0.5831	10900	0.1842	0.1284
3	50.93	0.4421	46.97	0.6403	50.93	0.4421	11090	0.3103	0.2125
4	54.24	0.1087	54.24	0.1087	36.04	0.5799	11090	0.0092	0.0062
5	50.12	0.5654	50.12	0.5654	49.18	0.5799	11100	0.2328	0.1723
Mean:	53.93	0.5084	46.41	0.5139	50.10	0.6139	11056	0.2372	0.1653
Standard Deviation:	3.35	0.2669	13.52	0.2745	8.65	0.1627	87	0.1623	0.1107

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 10VP-T
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 5.0000
Extensometer switch value: 50.0000% offset
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec. 3
Width (mm)	10.45	10.30	10.60
Thickness (mm)	3.15	3.00	3.00
Ext. gauge len (mm)	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00

Out of 3 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	37.34	1.1060	37.34	1.1060	36.68	1.0830	3282	0.3627	0.2204
2	37.92	1.6610	37.92	1.6610	37.69	1.6490	2370	0.5167	0.3345
3	40.65	2.4580	40.65	2.4580	40.57	2.4620	1746	0.8581	0.5397
Mean:	38.64	1.7417	38.64	1.7417	38.31	1.7313	2466	0.5792	0.3649
Standard Deviation:	1.77	0.6796	1.77	0.6796	2.02	0.6932	772	0.2535	0.1618

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 30VP-T
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	10.45	10.30	10.95	10.60
Thickness (mm)	3.15	3.00	3.00	3.00
Ext. gauge len (mm)	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	37.34	0.9648	37.34	0.9648	37.17	0.9596	3761	0.3165	0.1923
2	37.92	0.7955	37.92	0.7955	37.83	0.7934	4949	0.2475	0.1602
3	37.02	0.9066	37.02	0.9066	36.81	0.9021	4058	0.2747	0.1672
4	40.65	0.8675	40.65	0.8675	40.59	0.8659	4946	0.3029	0.1905
Mean:	38.23	0.8836	38.23	0.8836	38.10	0.8803	4429	0.2854	0.1776
Standard Deviation:	1.65	0.0710	1.65	0.0710	1.71	0.0696	611	0.0307	0.0163

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 40VP-T
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.65	10.25	10.25	10.00	9.65
Thickness (mm)	2.75	2.80	2.85	2.95	2.80
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	32.81	1.0160	32.81	1.0160	32.70	1.0120	3502	0.2742	0.1758
2	28.70	0.8563	31.61	0.9661	31.46	0.9676	3518	0.2542	0.1584
3	31.67	0.9612	31.67	0.9612	31.38	0.9676	3526	0.2549	0.1611
4	32.09	0.9179	32.94	0.9508	32.81	0.9456	3491	0.2542	0.1606
5	33.68	0.9449	16.09	1.9610	33.66	0.9456	3492	0.6316	0.4232
Mean:	31.79	0.9393	29.02	1.1710	32.40	0.9677	3506	0.3338	0.2158
Standard Deviation:	1.89	0.0586	7.26	0.4423	0.97	0.0271	16	0.1667	0.1161

Tensile Test
ASTM D 638-90

Tensile Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Tensile Test

Instron Coporation
Series IX Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: 50VP-T

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Humidity (%): 50
Crosshead Speed (mm/min): 5.0000
Temperature (deg. C): 25
Extensometer switch value: 50.0000% offset

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	10.70	11.50	10.85	11.00	11.00
Thickness (mm)	3.65	3.65	3.45	3.46	3.65
Ext. gauge len (mm)	50.00	50.00	50.00	50.00	50.00
Spec. gauge len (mm)	115.00	115.00	115.00	115.00	115.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at Max. Load (MPa)	% Strain at Max. Load (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	20.16	0.9697	7.24	1.9260	20.14	1.0190	2511	0.5108	0.2616
2	21.15	0.9688	9.18	3.2370	20.39	1.0190	2507	0.9477	0.4516
3	19.56	1.8060	6.94	4.2610	19.56	1.8350	2502	0.7907	0.4225
4	20.20	1.0111	6.82	3.2950	20.20	1.0190	2491	0.8755	0.4600
5	19.09	0.9499	7.05	2.7190	18.77	0.9682	2488	0.6087	0.3032
Mean:	20.03	1.1411	7.45	3.0876	19.81	1.1720	2500	0.7467	0.3798
Standard Deviation:	0.78	0.3723	0.98	0.8555	0.66	0.3712	10	0.1828	0.0912

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: PUP-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	11.35	12.20	13.45	13.45	12.30
Thickness (mm)	2.85	2.85	2.85	2.85	2.85
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	% Strain at x-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	1.4110	0.3776	3.818	5.129	11.290	1.5260	2967.0	0.5238	0.2024
2	1.6220	0.2761	6.408	1.420	7.944	1.2730	2229.0	0.1150	0.0413
3	1.1910	0.4018	3.642	4.489	6.405	1.5780	1127.0	0.4752	0.1550
4	0.1401	0.0301	3.712	4.330	4.807	1.0110	952.6	0.4885	0.1593
5	8.1940	0.5845	3.982	3.193	8.118	0.5749	1812.0	0.4220	0.1505
Mean:	2.5116	0.3340	4.312	3.712	7.713	1.1926	1817.5	0.4049	0.1417
Standard Deviation:	3.2271	0.2031	1.178	1.459	2.407	0.4125	823.9	0.1661	0.0598

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: INT-C
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.35	12.90	12.05	12.60	12.50
Thickness (mm)	3.00	2.95	2.90	2.90	3.05
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-nlp Yield (MPa)	% Strain at x-nlp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	7.9160	0.7357	5.510	0.930	7.916	0.7453	1851	0.1032	0.0348
2	7.8990	0.6360	3.246	1.412	7.791	0.7142	1849	0.2581	0.0848
3	7.4690	0.6424	3.452	0.789	7.746	0.6520	1850	0.0842	0.0301
4	8.6750	0.5583	3.026	1.019	8.675	0.5588	1850	0.1587	0.0543
5	7.9110	0.3949	7.060	0.505	7.826	0.4345	1849	0.0927	0.0304
Mean:	7.9740	0.5935	4.459	0.931	7.991	0.6210	1850	0.1394	0.0469
Standard Deviation:	0.4357	0.1276	1.761	0.332	0.388	0.1262	1	0.0725	0.0234

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: SMT-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.50	11.50	11.65	11.70	11.70
Thickness (mm)	2.90	3.00	2.95	3.00	2.95
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	% Strain at x-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	5.036	0.4993	1.777	0.921	5.036	0.5242	1835	0.0735	0.0253
2	6.225	1.1720	5.525	1.300	6.225	1.1830	1859	0.0606	0.0220
3	6.171	1.3240	2.187	1.565	6.171	1.3450	1883	0.0772	0.0281
4	6.195	0.4080	2.142	1.362	6.119	0.4229	1854	0.1555	0.0554
5	5.523	0.8924	1.945	1.148	5.523	0.9054	1919	0.0645	0.0234
Mean:	5.830	0.8591	2.715	1.259	5.815	0.8761	1870	0.0863	0.0308
Standard Deviation:	0.532	0.4025	1.579	0.241	0.519	0.4013	32	0.0393	0.0139

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series IX Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: 10MT-C

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	11.35	11.24	12.00	12.15	11.50
Thickness (mm)	2.80	2.95	2.95	2.85	2.90
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	7.730	0.5208	2.882	0.8787	7.730	0.5531	1852	0.1137	0.0447
2	7.839	0.5994	2.669	1.2120	7.756	0.5974	1742	0.1327	0.0500
3	7.901	0.8544	6.914	1.2770	7.901	0.9074	1850	0.2247	0.0793
4	8.211	0.3672	4.830	0.6107	8.211	0.3760	1741	0.1036	0.0374
5	7.702	0.5834	5.977	1.0270	7.702	0.5974	1849	0.1322	0.0495
Mean:	7.877	0.5850	4.654	1.0011	7.860	0.6063	1807	0.1414	0.0522
Standard Deviation:	0.204	0.1763	1.869	0.2686	0.211	0.1915	60	0.0482	0.0160

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: CMT-C

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	12.20	12.15	12.70	12.80
Thickness (mm)	2.75	3.00	2.85	2.80
Spec gauge len (mm)	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	8.001	0.9542	2.909	2.3800	7.880	0.9384	1810	0.2834	0.1056
2	7.976	0.6963	2.659	1.1820	7.971	0.7034	1807	0.1465	0.0503
3	7.857	0.7020	2.619	3.5930	7.857	0.7034	1897	0.4061	0.1403
4	8.248	0.9566	3.010	3.4550	8.150	1.0170	1852	0.4087	0.1425
Mean:	8.021	0.8273	2.799	2.6525	7.965	0.8406	1842	0.3112	0.1097
Standard Deviation:	0.159	0.1433	0.184	1.0847	0.129	0.1564	41	0.1204	0.0417

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 1T2-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.40	12.30	11.65	12.30	11.90
Thickness (mm)	3.00	3.00	2.95	3.00	3.00
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	% Strain at x-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.043	0.4837	3.464	0.7531	8.880	0.4790	2065	0.1209	0.0406
2	9.524	0.9810	3.370	1.6780	9.457	1.0550	1842	0.2749	0.0931
3	8.300	0.6913	2.839	3.1380	8.153	0.8307	1950	0.4320	0.1571
4	9.159	0.7709	3.177	1.6170	9.159	0.8627	1853	0.2570	0.0871
5	9.000	0.8454	3.099	1.7020	8.853	0.8627	1889	0.2175	0.0762
Mean:	9.005	0.7545	3.190	1.7776	8.900	0.8180	1920	0.2605	0.0908
Standard Deviation:	0.445	0.1852	0.244	0.8575	0.484	0.2093	91	0.1129	0.0423

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: ST2-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.75	12.15	12.70	12.30	12.15
Thickness (mm)	2.90	3.00	3.00	2.85	2.85
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.175	0.9711	3.059	2.7940	9.175	1.0330	1849	0.4079	0.1379
2	9.103	0.7872	8.557	1.0860	9.015	0.8854	1778	0.2144	0.0735
3	8.658	0.6893	3.354	1.0270	8.580	0.7377	1944	0.1354	0.0444
4	8.966	0.3369	3.146	1.1290	8.826	0.3538	1838	0.2170	0.0774
5	8.927	0.3620	5.521	0.8410	8.927	0.3833	1974	0.1565	0.0565
Mean:	8.966	0.6293	4.727	1.3754	8.905	0.6786	1877	0.2262	0.0779
Standard Deviation:	0.199	0.2749	2.370	0.8006	0.222	0.3019	81	0.1076	0.0361

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 1072-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.10	12.15	11.50	12.30	12.00
Thickness (mm)	2.85	3.00	2.95	2.95	3.00
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.007	1.4770	3.002	1.6180	8.960	1.4890	1948	0.0826	0.0300
2	8.998	1.3900	3.000	1.9870	8.998	1.3960	1927	0.1929	0.0662
3	8.737	1.0220	2.967	1.6680	8.737	1.0260	1810	0.1666	0.0614
4	8.732	0.8650	8.732	1.0320	8.732	0.9639	1848	0.1768	0.0609
5	8.904	1.8300	3.087	2.7540	8.904	1.8410	1929	0.2228	0.0773
Mean:	8.876	1.3168	4.158	1.8118	8.866	1.3432	1892	0.1683	0.0592
Standard Deviation:	0.135	0.3826	2.557	0.6294	0.125	0.3593	60	0.0524	0.0176

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: OT2-C

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	11.60	12.60	12.60	12.00	12.00
Thickness (mm)	2.85	2.80	2.80	2.80	3.00
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.173	0.7078	6.020	1.9260	9.173	0.7403	1931	0.3190	0.1206
2	0.406	0.6975	3.112	1.8640	9.200	1.2960	2253	0.1449	0.0513
3	8.814	1.2620	3.045	3.1490	8.654	1.2960	1974	0.3803	0.1347
4	9.001	1.8470	5.935	2.1200	8.988	1.9040	2009	0.1273	0.0474
5	9.126	0.6990	3.619	0.8569	8.989	0.6874	2069	0.0984	0.0342
Mean:	7.304	1.0427	4.346	1.9832	9.001	1.1847	2047	0.2140	0.0776
Standard Deviation:	3.858	0.5110	1.506	0.8160	0.218	0.4967	126	0.1268	0.0464

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: IT5-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.55	12.60	11.95	12.30	12.75
Thickness (mm)	2.85	2.90	2.85	2.80	3.00
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.245	0.4697	3.414	1.2560	9.245	0.4829	1813	0.2045	0.0715
2	9.803	0.9195	3.735	1.1710	9.803	0.9316	1903	0.1525	0.0522
3	10.120	0.4690	3.373	1.7350	10.120	0.5001	1866	0.3003	0.1102
4	9.901	0.6210	4.100	0.7918	9.900	0.6210	1845	0.1142	0.0415
5	9.988	0.5824	5.708	1.8830	9.939	0.5864	1870	0.4118	0.1346
Mean:	9.811	0.6123	4.066	1.3674	9.801	0.6244	1859	0.2367	0.0820
Standard Deviation:	0.337	0.1845	0.963	0.4425	0.332	0.1812	33	0.1202	0.0394

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: ST5-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.20	12.00	11.55	12.65	12.30
Thickness (mm)	2.90	2.75	2.80	2.75	2.90
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.948	1.1990	3.658	1.8120	9.899	1.2240	1914	0.2063	0.0729
2	9.750	0.7585	3.413	2.4560	9.750	0.8566	2086	0.3621	0.1372
3	10.300	0.6775	3.636	1.2210	10.300	0.7341	1789	0.2192	0.0847
4	9.900	0.5000	3.444	3.0720	9.900	0.5504	1966	0.5673	0.2039
5	9.255	0.5673	3.650	0.8420	9.255	0.6117	2093	0.1233	0.0432
Mean:	9.831	0.7405	3.560	1.8806	9.821	0.7954	1970	0.2956	0.1084
Standard Deviation:	0.380	0.2749	0.121	0.9040	0.377	0.2669	127	0.1745	0.0633

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 10T5-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.65	12.10	12.00	12.55	12.75
Thickness (mm)	2.65	2.90	2.65	2.75	2.85
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	10.140	0.4221	3.451	2.2910	10.140	0.4233	2061	0.4610	0.1719
2	9.854	1.0050	4.751	1.2020	9.854	1.0170	1884	1263.0000	0.0450
3	9.616	0.5435	3.629	1.0140	9.616	0.5717	1994	1533.0000	0.0603
4	9.390	0.8287	5.907	1.6870	9.390	0.8471	1898	0.2544	0.0921
5	9.275	0.8331	5.311	0.8880	9.218	0.8259	1711	0.0997	0.0343
Mean:	9.655	0.7265	4.610	1.4164	9.644	0.7370	1910	559.3630	0.0807
Standard Deviation:	0.350	0.2374	1.061	0.5756	0.366	0.2367	133	771.4724	0.0554

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Operator name: KONGSAK

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Sample Identification: OT5-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.20	12.00	12.35	12.30	12.30
Thickness (mm)	2.70	2.70	2.75	2.85	2.85
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.691	1.7300	3.461	4.4390	9.921	1.8460	1946	0.5489	0.2083
2	10.140	0.8614	6.083	4.8700	10.140	0.9569	1940	0.9198	0.3549
3	10.120	1.4230	3.531	5.2960	10.120	1.5380	1952	0.8286	0.3050
4	9.613	0.8804	3.286	2.2070	9.613	0.8885	1955	0.3386	0.1207
5	9.743	0.8799	3.712	1.0880	9.743	0.8885	1962	0.1411	0.0503
Mean:	9.861	1.1549	4.015	3.5800	9.907	1.2236	1951	0.5554	0.2078
Standard Deviation:	0.250	0.3999	1.166	1.8331	0.231	0.4421	8	0.3264	0.1260

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series IX Automated Materials Testing Testing System 1.

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: IT8-C
Interface Type: 4200 Series

Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.25	11.90	11.95	12.25	12.35
Thickness (mm)	2.90	2.80	2.95	2.95	2.90
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	10.100	0.6331	6.241	1.5190	9.912	0.6105	1929	0.2934	0.1032
2	10.160	0.1746	6.142	2.4170	10.150	0.2031	2071	0.5912	0.2218
3	10.320	0.4221	3.968	1.7370	10.320	0.4650	2021	0.3762	0.1334
4	-	-	3.379	3.1640	9.798	1.1630	1990	0.4868	0.1684
5	9.999	0.6800	3.913	3.3420	9.918	0.7560	1919	0.7347	0.2564
Mean:	-	-	4.729	2.4358	Compressive ASTM D 695 M	0.6395	1986	0.4965	0.1766
Standard Deviation:	-	-	1.356	0.8186	0.211	0.3568	64	0.1743	0.0627

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: 5T8-C

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.20	12.45	12.10	11.65	11.80
Thickness (mm)	2.90	3.00	3.00	2.85	2.90
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.977	1.0750	4.098	2.5500	9.799	1.1800	1955	0.5015	0.1772
2	9.990	0.4924	3.533	0.9866	9.990	0.5109	2243	0.1771	0.0593
3	11.200	1.4730	3.807	2.1770	11.080	1.4560	2407	0.2706	0.0932
4	9.604	0.8183	9.039	1.0190	9.604	0.8660	2258	0.1599	0.0602
5	10.010	0.9087	5.003	1.4980	10.010	1.0630	2249	0.2621	0.0957
Mean:	10.156	0.9535	5.096	1.6461	10.097	1.0152	2222	0.2742	0.0971
Standard Deviation:	0.607	0.3597	2.272	0.6980	0.574	0.3537	164	0.1363	0.0480

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 10T8-C
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	11.80	12.00	12.05	12.45	12.50
Thickness (mm)	3.00	3.00	3.00	3.00	2.95
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	% Strain at x-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.973	1.0750	3.400	6.5230	9.747	1.1150	2053	1.1290	0.3987
2	9.927	0.4825	3.368	0.5850	9.927	0.4995	2047	0.1542	0.0535
3	10.950	0.7674	3.650	1.8130	10.950	0.8073	2046	0.3579	0.1238
4	9.256	0.7020	3.232	3.0320	9.256	0.7688	2070	0.5173	0.1731
5	10.000	1.4120	7.869	1.7160	10.000	1.4230	2047	0.1969	0.0668
Mean:	10.021	0.8878	4.304	2.7338	9.976	0.9227	2053	0.4711	0.1632
Standard Deviation:	0.604	0.3616	1.999	2.2884	0.617	0.3547	10	0.3948	0.1400

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: OT8-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	11.90	12.10	11.90	12.00	11.80
Thickness (mm)	2.95	2.90	2.95	2.95	2.85
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.588	0.9588	4.110	4.8660	9.588	1.0450	2055	1.0060	0.3582
2	10.570	0.2861	6.446	0.8239	10.440	0.3367	2056	0.2631	0.0937
3	10.600	0.6535	4.579	3.4240	10.600	1.0450	2032	0.8287	0.2951
4	10.960	0.6979	7.235	2.3370	10.960	0.7752	2033	0.5528	0.1952
5	10.600	0.2984	9.583	0.9169	10.600	0.3704	2090	0.4505	0.1674
Mean:	10.464	0.5789	6.391	2.4736	10.438	0.7145	2053	0.6202	0.2219
Standard Deviation:	0.515	0.2865	2.202	1.7168	0.512	0.3476	24	0.2971	0.1049

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 1GP-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.56	12.60	12.25	12.20	12.20
Thickness (mm)	2.75	2.85	2.65	2.75	2.85
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	13.520	0.9982	9.436	2.812	13.520	1.067	3515	0.8336	0.3017
2	14.140	0.4374	5.892	6.827	14.060	0.444	3527	1.5580	0.5425
3	14.220	0.0769	7.601	8.968	14.200	0.088	3507	2.3730	0.9136
4	15.000	0.6685	10.160	2.923	15.000	0.711	3485	0.9261	0.3450
5	14.210	0.7133	8.105	1.590	14.180	0.711	3490	0.3403	0.1224
Mean:	14.218	0.5789	8.239	4.6240	14.192	0.6041	3505	1.2062	0.4450
Standard Deviation:	0.526	0.3442	1.663	3.1266	0.530	0.3637	17	0.7830	0.3015

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: SGP-C
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.90	12.55	12.35	12.45	12.45
Thickness (mm)	2.95	2.90	2.85	2.95	2.85
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	14.560	0.6776	9.056	2.486	14.290	0.681	4386	0.2257	0.3017
2	14.540	1.3040	8.218	2.115	14.540	1.314	3425	0.1417	0.5425
3	14.220	0.6501	5.048	2.273	14.060	0.657	3879	0.1310	0.9136
4	13.570	1.0560	8.276	4.345	13.520	1.095	3839	0.3494	0.3450
5	14.100	1.2600	6.266	1.787	14.100	1.266	4070	0.0745	0.1224
Mean:	14.198	0.9895	7.373	2.6012	14.102	1.0026	3920	0.1845	0.4450
Standard Deviation:	0.404	0.3118	1.658	1.0076	0.377	0.3153	351	0.1069	0.3015

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 10GP-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	13.20	13.25	13.25	13.20
Thickness (mm)	2.95	2.85	2.85	2.95
Spec gauge len (mm)	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	% Strain at x-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	13.400	0.7122	4.699	1.0210	13.390	0.7118	3560	0.1680	0.0539
2	15.000	0.5732	11.410	1.7250	15.000	0.5783	3553	0.6071	0.2010
3	14.570	0.4920	11.490	3.0750	14.430	0.4893	3548	1.1060	0.3660
4	14.300	1.0480	8.253	2.6530	14.190	1.0380	3568	0.8641	0.2774
Mean:	14.318	0.7064	8.963	2.1185	14.253	0.7044	3557	0.6863	0.2246
Standard Deviation:	0.676	0.2452	3.218	0.9237	0.668	0.2405	9	0.4011	0.1323

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Operator name: KONGSAK

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Sample Identification: CGP-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	12.55	12.10	12.40	12.50
Thickness (mm)	2.75	2.80	2.65	2.75
Spec gauge len (mm)	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	14.400	1.4860	4.952	4.7590	14.130	1.4750	3564	0.6154	0.2229
2	15.300	1.2660	6.190	2.2960	15.220	1.2970	3571	0.4196	0.1548
3	14.100	0.6287	6.136	3.2540	14.100	0.6610	3569	0.7802	0.2968
4	13.210	0.6596	5.350	2.1520	13.200	0.6610	3569	0.3466	0.1260
Mean:	14.253	1.0101	5.657	3.1153	14.163	1.0235	3568	0.5405	0.2001
Standard Deviation:	0.862	0.4322	0.607	1.2000	0.827	0.4248	3	0.1960	0.0762

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: 10VP-C

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	11.80	13.25	12.55	13.20	12.75
Thickness (mm)	3.00	3.00	3.00	3.00	3.00
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	8.503	0.6817	5.619	0.894	8.503	0.702	1744	0.1202	0.0424
2	9.000	0.6452	7.925	0.960	8.866	0.660	1885	0.1735	0.0546
3	8.541	1.2810	8.541	1.310	8.541	1.306	1789	0.1009	0.0335
4	8.476	1.5850	6.633	2.208	8.476	1.615	1729	0.2585	0.0816
5	8.001	0.4446	5.685	0.931	7.976	0.461	1737	0.1689	0.0552
Mean:	8.504	0.9275	6.881	1.2605	8.472	0.9487	1777	0.1644	0.0535
Standard Deviation:	0.354	0.4823	1.316	0.5554	0.319	0.4884	65	0.0611	0.0181

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 19 Apr 1993

Sample Identification: 30VP-C

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.35	12.00	12.95	12.30	13.00
Thickness (mm)	3.00	3.00	3.00	3.00	3.00
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	12.570	0.8029	4.220	1.375	12.500	0.799	2313	0.2239	0.0755
2	9.517	0.5627	3.595	1.742	9.416	0.559	2330	0.2521	0.0875
3	11.760	0.2654	3.961	1.541	11.760	0.279	2329	0.3521	0.1133
4	10.540	0.7225	3.513	1.971	10.450	0.719	2330	0.2853	0.0966
5	11.010	0.4889	3.758	2.299	10.870	0.479	2331	0.4705	0.1508
Mean:	11.079	0.5685	3.809	1.7856	10.999	0.5669	2327	0.3168	0.1047
Standard Deviation:	1.164	0.2103	0.286	0.3634	1.189	0.2047	8	0.0983	0.0292

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 40VP-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	12.35	12.00	12.95	12.30	13.00
Thickness (mm)	3.00	3.00	3.00	3.00	3.00
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	9.927	0.8868	3.333	1.418	9.927	0.894	1977	0.1648	0.0556
2	6.711	0.9561	2.536	2.960	6.641	0.963	1022	0.3021	0.1049
3	6.772	0.6136	2.280	1.688	6.772	0.619	1445	0.1724	0.0555
4	6.330	0.5016	2.110	1.589	6.259	0.515	1645	0.1487	0.0504
5	5.645	0.2734	1.927	1.866	5.576	0.309	1358	0.2116	0.0678
Mean:	7.077	0.6463	2.437	1.9042	7.035	0.6598	1489	0.1999	0.0668
Standard Deviation:	1.655	0.2806	0.549	0.6121	1.682	0.2702	353	0.0616	0.0222

Compressive Test
ASTM D 695 M

Compressive Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Compressive

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 19 Apr 1993

Operator name: KONGSAK

Sample Identification: 50VP-C
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 10.000
Crosshead Speed (mm/min): 1.0000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	13.20	13.30	12.50	13.35	13.10
Thickness (mm)	3.00	3.20	3.40	3.20	3.20
Spec gauge len (mm)	80.00	80.00	80.00	80.00	80.00
Platen Separ. (mm)	80.00	80.00	80.00	80.00	80.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	% Strain at s-slp Yield (%)	Stress at Auto. Break (MPa)	% Strain at Auto. Break (%)	Stress at Cursor Point 1 (MPa)	% Strain at Cursor Point 1 (%)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	8.000	1.0060	2.793	3.428	8.000	1.083	999	0.5216	0.1646
2	7.499	0.9640	2.602	2.797	7.499	1.083	1054	0.4368	0.1283
3	6.972	0.7224	2.421	2.894	6.972	0.750	1228	0.3638	0.1070
4	7.479	1.2140	2.493	2.651	7.307	1.250	1652	0.2609	0.0763
5	7.531	0.7174	3.373	1.566	7.460	0.708	1641	0.2073	0.0618
Mean:	7.496	0.9248	2.736	2.6672	7.448	0.9747	1315	0.3581	0.1076
Standard Deviation:	0.364	0.2096	0.382	0.6819	0.372	0.2350	315	0.1276	0.0411

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: PUP-P
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	26.15	26.15	25.70	26.15	26.15
Thickness (mm)	3.00	3.00	2.85	3.00	3.00
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	Strain at x-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	44.49	0.0231	43.63	0.0229	44.49	0.0231	2260	0.2474	0.0631
2	45.73	0.0134	21.52	0.0134	45.73	0.0134	3111	0.1617	0.0412
3	46.30	0.0189	45.33	0.0189	46.30	0.0189	2604	0.2075	0.0566
4	48.65	0.0222	47.91	0.0222	48.65	0.0222	2366	0.2605	0.0664
5	42.00	0.0184	41.92	0.0185	42.00	0.0184	2714	0.2038	0.0520
Mean:	45.43	0.0192	40.06	0.0192	45.43	0.0192	2611	0.2162	0.0559
Standard Deviation:	2.44	0.0038	10.60	0.0038	2.44	0.0038	333	0.0392	0.0099

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: INT-P
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.75	25.90	25.00	25.00	24.95
Thickness (mm)	3.00	3.00	3.00	3.00	3.00
Span (mm)	50.00	3.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	52.50	0.0205	51.75	0.0198	52.50	0.0205	2996	0.2717	0.0703
2	52.99	0.0208	52.99	0.0202	52.99	0.0208	3542	0.2832	0.0729
3	51.94	0.0217	50.98	0.0217	51.94	0.0217	2834	0.2784	0.0743
4	52.30	0.0171	50.76	0.0166	52.30	0.0171	3289	0.2039	0.0544
5	53.43	0.0175	53.87	0.0174	53.43	0.0175	2814	0.2145	0.0573
Mean:	52.63	0.0195	52.07	0.0191	52.63	0.0195	3095	0.2503	0.0658
Standard Deviation:	0.59	0.0021	1.33	0.0021	0.59	0.0021	314	0.0380	0.0093

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: SHT-P
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.80	26.05	24.60	25.80	26.10
Thickness (mm)	3.00	3.00	2.95	2.95	2.95
Span (mm)	50.00	3.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	54.49	0.0250	53.19	0.0249	54.49	0.0250	3069	0.3415	0.0882
2	53.31	0.0250	52.01	0.0245	53.31	0.0250	3095	0.3313	0.0848
3	51.64	0.0256	51.64	0.0259	51.64	0.0256	3052	0.3476	0.0958
4	51.40	0.0170	51.40	0.0171	51.40	0.0170	3072	0.2054	0.0540
5	49.79	0.0178	49.79	0.0177	49.79	0.0178	3058	0.2354	0.0611
Mean:	52.13	0.0221	51.61	0.0220	52.13	0.0221	3069	0.2922	0.0768
Standard Deviation:	1.82	0.0043	1.23	0.0043	1.82	0.0043	17	0.0667	0.0182

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 10HT-P
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.55	24.85	25.95	23.55	24.30
Thickness (mm)	3.00	2.90	2.80	2.90	2.90
Span (mm)	50.00	3.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	52.04	0.0302	50.61	0.0277	52.04	0.0302	2999	0.4006	0.1045
2	51.19	0.0227	51.19	0.0232	51.19	0.0227	2770	0.3025	0.0840
3	51.42	0.0239	51.42	0.0241	51.42	0.0239	3003	0.3227	0.0888
4	52.15	0.0185	50.52	0.0181	52.15	0.0185	2937	0.1886	0.0552
5	52.44	0.0254	52.44	0.0260	52.44	0.0254	3054	0.3360	0.0954
Mean:	51.85	0.0241	51.24	0.0238	51.85	0.0241	2953	0.3101	0.0856
Standard Deviation:	0.52	0.0042	0.77	0.0036	0.52	0.0042	110	0.0772	0.0186

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 21 Apr 1993

Sample Identification: ONT-P

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	24.70	24.65	25.10	25.35	24.95
Thickness (mm)	2.85	2.80	3.00	3.00	2.90
Span (mm)	50.00	3.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (MaaYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	51.70	0.0390	51.70	0.0352	51.70	0.0390	2704	0.5105	0.1450
2	53.57	0.0196	52.04	0.0156	53.57	0.0196	3880	0.1563	0.0453
3	54.61	0.0272	53.43	0.0268	54.61	0.0272	2420	0.3511	0.0933
4	50.67	0.0195	50.29	0.0196	50.67	0.0195	2549	0.2251	0.0592
5	50.40	0.0194	50.40	0.0194	50.40	0.0194	2861	0.2053	0.0567
Mean:	52.19	0.0249	51.57	0.0233	52.19	0.0249	2883	0.2897	0.0799
Standard Deviation:	1.84	0.0085	1.29	0.0078	1.84	0.0085	581	0.1428	0.0406

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 1T2-F
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	25.20	25.05	25.05	25.05
Thickness (mm)	3.00	3.00	3.00	3.00
Span (mm)	50.00	3.00	50.00	50.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at r-slp Yield (MPa)	Strain at r-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	58.56	0.0282	58.56	0.0281	58.56	0.0282	3220	0.4577	0.1211
2	66.35	0.0188	64.47	0.0188	66.35	0.0188	3109	0.2977	0.0792
3	64.15	0.0161	61.36	0.0160	64.15	0.0161	3118	0.2236	0.0595
4	60.68	0.0166	59.65	0.0167	60.68	0.0166	3208	0.2413	0.0642
Mean:	62.44	0.0199	61.01	0.0199	62.44	0.0199	3164	0.3051	0.0810
Standard Deviation:	3.37	0.0055	2.50	0.0054	3.37	0.0055	56	0.1032	0.0271

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 5T2-F
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.00	25.20	24.60	25.65	25.10
Thickness (mm)	2.90	2.95	3.00	2.90	2.90
Span (mm)	50.00	3.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	63.43	0.0256	41.73	0.0257	63.43	0.0256	3217	0.3781	0.1043
2	62.93	0.0247	53.94	0.0248	62.93	0.0247	2782	0.3558	0.0957
3	62.13	0.0290	60.58	0.0291	62.13	0.0290	3115	0.4255	0.1153
4	63.98	0.0196	49.76	0.0197	63.98	0.0196	4203	0.3106	0.0835
5	62.23	0.0172	55.31	0.0174	62.23	0.0172	3200	0.2165	0.0595
Mean:	62.94	0.0232	52.26	0.0233	62.94	0.0232	3303	0.3373	0.0917
Standard Deviation:	0.79	0.0048	7.04	0.0047	0.79	0.0048	533	0.0792	0.0214

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing Systen 1.19

Operator name: KONGSAK

Test Date: 21 Apr 1993

Sample Identification: 1072-F

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.75	25.80	25.55	25.45	24.50
Thickness (mm)	3.00	2.95	2.95	3.00	3.00
Span (mm)	50.00	3.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (MamYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	62.22	0.0504	62.14	0.0501	62.22	0.0504	3219	0.8382	0.2170
2	63.27	0.0277	63.27	0.0277	63.27	0.0277	3110	0.3873	0.1018
3	61.48	0.0262	60.38	0.0261	61.48	0.0262	3115	0.3707	0.0984
4	62.05	0.0205	59.91	0.0192	62.05	0.0205	3209	0.2675	0.0701
5	62.10	0.0184	54.64	0.0186	62.10	0.0184	3199	0.2356	0.0641
Mean:	62.22	0.0286	60.07	0.0283	62.22	0.0286	3170	0.4199	0.1103
Standard Deviation:	0.65	0.0128	3.32	0.0128	0.65	0.0128	53	0.2427	0.0619

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: OT2-P
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	24.35	25.20	25.35	25.00	25.15
Thickness (mm)	3.00	2.85	2.95	3.00	2.85
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	Strain at x-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	62.15	0.0215	58.24	0.0217	62.15	0.0215	3219	0.3388	0.0928
2	63.20	0.0311	46.18	0.0312	63.20	0.0311	3110	0.4410	0.1228
3	63.58	0.0393	62.51	0.0394	63.58	0.0393	3119	0.5757	0.1540
4	60.52	0.0234	60.52	0.0238	60.52	0.0234	3207	0.3293	0.0878
5	58.17	0.0268	58.17	0.0273	58.17	0.0268	3200	0.3698	0.1032
Mean:	61.52	0.0284	57.12	0.0287	61.52	0.0284	3171	0.4109	0.1121
Standard Deviation:	2.22	0.0071	6.38	0.0070	2.22	0.0071	52	0.1020	0.0270

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 175-P
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.50	24.95	25.45	25.20	25
Thickness (mm)	2.85	2.90	2.85	2.85	2.95
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	69.13	0.0330	67.31	0.0328	69.13	0.0330	3081	0.5169	0.1420
2	69.56	0.0243	58.85	0.0244	69.56	0.0243	3332	0.3414	0.0944
3	68.90	0.0295	62.99	0.0296	68.90	0.0295	3007	0.4499	0.1240
4	68.52	0.0234	66.24	0.0232	68.52	0.0234	3529	0.3215	0.0895
5	66.94	0.0280	52.47	0.0283	66.94	0.0280	2750	0.4525	0.1227
Mean:	68.61	0.0276	61.57	0.0277	68.61	0.0276	3140	0.4164	0.1145
Standard Deviation:	1.01	0.0039	6.06	0.0039	1.01	0.0039	301	0.0824	0.0220

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 5T5-P
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.85	25.80	25.00	25.45	26.7
Thickness (mm)	2.80	3.00	2.85	2.75	2.85
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	70.02	0.0243	64.83	0.0245	70.02	0.0243	3250	0.3288	0.0909
2	70.33	0.0208	68.79	0.0206	70.33	0.0208	3249	0.3068	0.0793
3	67.88	0.0283	67.88	0.0283	67.88	0.0283	3250	0.3924	0.1102
4	66.76	0.0289	45.30	0.0292	66.76	0.0289	3251	0.3745	0.1070
5	66.65	0.0254	41.02	0.0257	66.65	0.0254	3249	0.3329	0.0875
Mean:	68.33	0.0255	57.56	0.0257	68.33	0.0255	3250	0.3471	0.0950
Standard Deviation:	1.76	0.0033	13.32	0.0034	1.76	0.0033	1	0.0352	0.0132

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 1075-P
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4
Width (mm)	25.50	24.80	25.40	24.80
Thickness (mm)	2.70	2.65	2.95	2.60
Span (mm)	50.00	3.00	50.00	50.00

Out of 4 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	67.93	0.0226	53.04	0.0228	67.93	0.0226	3246	0.3190	0.0927
2	67.93	0.0220	46.85	0.0221	67.93	0.0220	3230	0.2865	0.0872
3	68.54	0.0208	61.90	0.0210	68.54	0.0208	3230	0.3228	0.0862
4	67.28	0.0193	66.15	0.0192	67.28	0.0193	3612	0.2429	0.0753
Mean:	67.92	0.0212	56.99	0.0213	67.92	0.0212	3330	0.2928	0.0854
Standard Deviation:	0.51	0.0015	8.69	0.0016	0.51	0.0015	188	0.0370	0.0073

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 21 Apr 1993

Sample Identification: OT5-F

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.85	25.80	25.00	25.45	26.7
Thickness (mm)	2.80	3.00	2.85	2.75	2.85
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (KPa)	Strain at x-slp Yield (mm/mm)	Stress at user Break (KPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (KPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (MonYoung) (KPa)	Energy to Break Point (J)	Toughness (KPa)
1	68.44	0.0280	12.73	0.0282	68.44	0.0280	3107	0.3903	0.1078
2	70.18	0.0239	69.83	0.0239	70.18	0.0239	3876	0.3884	0.1003
3	70.14	0.0301	12.93	0.0303	70.14	0.0301	3231	0.4138	0.1161
4	69.19	0.0193	42.83	0.0194	69.19	0.0193	3254	0.2491	0.0712
5	69.82	0.0294	68.07	0.0288	69.82	0.0294	3175	0.4751	0.1249
Mean:	69.55	0.0261	41.28	0.0261	69.55	0.0261	3329	0.3833	0.1041
Standard Deviation:	0.74	0.0045	28.08	0.0044	0.74	0.0045	311	0.0828	0.0205

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 21 Apr 1993

Sample Identification: 178-F

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.60	25.40	26.05	25.40	25.4
Thickness (mm)	2.80	2.80	2.85	3.00	3.00
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	Strain at x-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	73.93	0.0195	55.45	0.0282	73.93	0.0195	3310	0.3152	0.0879
2	72.12	0.0210	70.37	0.0196	72.12	0.0210	3296	0.3177	0.0893
3	70.42	0.0207	36.35	0.0209	70.42	0.0207	3287	0.3268	0.0880
4	69.68	0.0287	67.26	0.0288	69.68	0.0287	3314	0.5382	0.1413
5	72.78	0.0227	70.22	0.0226	72.78	0.0227	3291	0.3653	0.0959
Mean:	71.79	0.0225	59.93	0.0240	71.79	0.0225	3300	0.3726	0.1005
Standard Deviation:	1.73	0.0036	14.53	0.0042	1.73	0.0036	12	0.0947	0.0231

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: ST8-F
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.90	25.30	25.80	25.10	25.75
Thickness (mm)	2.95	2.90	2.90	3.00	2.90
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	70.49	0.0200	41.86	0.0203	70.49	0.0200	3313	0.3777	0.0989
2	70.52	0.0240	68.56	0.0237	70.52	0.0240	3310	0.4103	0.1119
3	71.68	0.0265	71.68	0.0269	71.68	0.0265	3315	0.4910	0.1312
4	71.00	0.0201	68.85	0.0193	71.00	0.0201	3283	0.3695	0.0981
5	71.00	0.0246	64.92	0.0250	71.00	0.0246	3281	0.4417	0.1183
Mean:	70.94	0.0230	63.17	0.0230	70.94	0.0230	3300	0.4180	0.1117
Standard Deviation:	0.48	0.0029	12.15	0.0032	0.48	0.0029	17	0.0498	0.0139

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 10T8-F
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.60	25.65	25.65	25.65	25.05
Thickness (mm)	3.00	3.00	3.00	3.00	3.00
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	71.82	0.0214	65.09	0.0215	71.82	0.0214	3299	0.4151	0.1081
2	70.70	0.0344	70.70	0.0340	70.70	0.0344	2632	0.7083	0.1841
3	73.55	0.0215	71.38	0.0219	73.55	0.0215	3300	0.4544	0.1181
4	71.58	0.0287	27.09	0.0290	71.58	0.0287	3300	0.5934	0.1542
5	73.98	0.0245	51.38	0.0248	73.98	0.0245	3301	0.5028	0.1338
Mean:	72.33	0.0261	57.13	0.0262	72.33	0.0261	3166	0.5348	0.1397
Standard Deviation:	1.39	0.0055	18.61	0.0053	1.39	0.0055	299	0.1176	0.0303

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: OT8-F
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.80	25.80	25.10	25.80	25.45
Thickness (mm)	2.90	3.00	2.90	2.95	3.00
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	72.11	0.0231	43.65	0.0236	72.11	0.0231	3313	0.4359	0.1165
2	71.79	0.0267	69.68	0.0262	71.79	0.0267	3329	0.4502	0.1163
3	73.05	0.0199	67.83	0.0202	73.05	0.0199	3304	0.3135	0.0861
4	71.89	0.0286	70.24	0.0286	71.89	0.0286	3297	0.5003	0.1315
5	73.56	0.0252	71.27	0.0251	73.56	0.0252	3280	0.4398	0.1152
Mean:	72.48	0.0247	64.53	0.0247	72.48	0.0247	3305	0.4279	0.1131
Standard Deviation:	0.78	0.0034	11.74	0.0031	0.78	0.0034	18	0.0690	0.0165

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 21 Apr 1993

Sample Identification: IGP-F

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.00	24.10	24.50	26.60	26
Thickness (mm)	2.70	2.80	2.75	2.80	2.75
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (MonYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	87.86	0.0224	89.72	0.0223	87.86	0.0224	6259	0.4579	0.1357
2	92.24	0.0241	91.62	0.0241	92.24	0.0241	5118	0.4430	0.1313
3	97.56	0.0193	95.85	0.0196	97.56	0.0193	6322	0.3829	0.1137
4	90.55	0.0217	85.86	0.0218	90.55	0.0217	5364	0.4432	0.1190
5	97.78	0.0223	92.42	0.0223	97.78	0.0223	6102	0.4422	0.1237
Mean:	93.20	0.0220	91.09	0.0220	93.20	0.0220	5833	0.4338	0.1247
Standard Deviation:	4.37	0.0017	3.67	0.0016	4.37	0.0017	553	0.0292	0.0089

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: SGP-F
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.45	25.30	25.80	26.00	25.9
Thickness (mm)	2.85	2.85	3.00	2.80	2.80
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (MaxYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	98.57	0.0238	97.73	0.0238	98.57	0.0238	5242	0.4720	0.1302
2	98.71	0.0208	96.66	0.0205	98.71	0.0208	5268	0.4539	0.1259
3	99.48	0.0313	99.48	0.0315	99.48	0.0313	5370	0.8245	0.2131
4	97.77	0.0296	94.48	0.0298	97.77	0.0296	5185	0.6991	0.1921
5	95.88	0.0223	84.60	0.0226	95.88	0.0223	5340	0.5114	0.1410
Mean:	98.08	0.0256	94.59	0.0256	98.08	0.0256	5281	0.5922	0.1605
Standard Deviation:	1.37	0.0046	5.87	0.0048	1.37	0.0046	75	0.1624	0.0396

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 10GF-P
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.80	25.35	25.45	25.05	25.45
Thickness (mm)	2.80	2.75	2.80	2.80	2.90
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (KanYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	99.10	0.0211	98.06	0.0213	99.10	0.0211	5498	0.4169	0.1154
2	104.50	0.0216	98.41	0.0216	104.50	0.0216	5498	0.4359	0.1251
3	105.10	0.0228	105.10	0.0228	105.10	0.0228	5496	0.4799	0.1347
4	100.80	0.0195	92.70	0.0196	100.80	0.0195	5499	0.4074	0.1162
5	99.97	0.0216	99.35	0.0213	99.97	0.0216	5502	0.4544	0.1231
Mean:	101.89	0.0213	98.72	0.0213	101.89	0.0213	5499	0.4389	0.1229
Standard Deviation:	2.73	0.0012	4.41	0.0011	2.73	0.0012	2	0.0292	0.0078

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: CGF-F
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:

Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.25	25.10	25.40	25.85	25.85
Thickness (mm)	2.75	2.80	2.65	2.75	2.75
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (KPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (KPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (KPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (MaxYoung) (KPa)	Energy to Break Point (J)	Toughness (KPa)
1	101.40	0.0231	99.79	0.0232	101.40	0.0231	5700	0.5073	0.1461
2	100.30	0.0205	99.60	0.0202	100.30	0.0205	5702	0.4345	0.1236
3	102.20	0.0234	101.90	0.0231	102.20	0.0234	5698	0.5169	0.1536
4	107.30	0.0346	105.40	0.0349	107.30	0.0346	5702	0.9659	0.2718
5	106.60	0.0263	102.20	0.0266	106.60	0.0263	5698	0.5780	0.1626
Mean:	103.56	0.0256	101.78	0.0256	103.56	0.0256	5700	0.6005	0.1715
Standard Deviation:	3.18	0.0054	2.35	0.0057	3.18	0.0054	2	0.2105	0.0579

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series IX Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 21 Apr 1993

Sample Identification: 10VP-F

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000

Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.25	25.10	25.40	25.85	25.85
Thickness (mm)	2.75	2.80	2.65	2.75	2.75
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	Strain at x-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (MaxYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	57.77	0.0141	10.83	0.0142	57.77	0.0141	3180	0.2253	0.0579
2	56.96	0.0252	56.96	0.0252	56.96	0.0252	3170	0.3792	0.0982
3	56.69	0.0201	36.34	0.0203	56.69	0.0201	3198	0.3149	0.0835
4	54.97	0.0185	9.36	0.0186	54.97	0.0185	3197	0.2885	0.0754
5	56.35	0.0190	24.90	0.0192	56.35	0.0190	3190	0.2879	0.0759
Mean:	56.55	0.0194	27.68	0.0195	56.55	0.0194	3187	0.2992	0.0782
Standard Deviation:	1.03	0.0040	19.74	0.0039	1.03	0.0040	12	0.0556	0.0146

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19

Operator name: KONGSAK

Test Date: 21 Apr 1993

Sample Identification: 30VP-F

Sample Type: ASTM

Interface Type: 4200 Series
Machine Parameters of test:

Sample Rate (pts/sec): 20.000

Humidity (%): 50

Crosshead Speed (mm/min): 1.3000

Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.75	25.80	25.75	25.80	25.8
Thickness (mm)	3.00	3.00	3.00	3.00	3.00
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	77.07	0.0276	69.90	0.0277	77.07	0.0276	3423	0.5760	0.1491
2	76.54	0.0283	72.81	0.0284	76.54	0.0283	3435	0.5926	0.1531
3	75.49	0.0210	73.85	0.0208	75.49	0.0210	3420	0.4344	0.1125
4	75.99	0.0289	74.39	0.0288	75.99	0.0289	3413	0.5622	0.1453
5	76.38	0.0241	61.41	0.0242	76.38	0.0241	3411	0.4856	0.1255
Mean:	76.29	0.0260	70.47	0.0260	76.29	0.0260	3420	0.5302	0.1371
Standard Deviation:	0.59	0.0033	5.35	0.0034	0.59	0.0033	10	0.0674	0.0174

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series IX Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 40VP-P
Interface Type: 4200 Series
Sample Type: ASTM

Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Crosshead Speed (mm/min): 1.3000
Humidity (%): 50
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	25.15	25.80	25.35	25.50	25.25
Thickness (mm)	3.00	3.15	3.15	3.20	3.15
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at x-slp Yield (MPa)	Strain at x-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (MonYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	68.97	0.0386	67.36	0.0373	68.97	0.0386	3200	0.6240	0.1654
2	69.12	0.0317	63.93	0.0319	69.12	0.0317	3199	0.5714	0.1406
3	66.83	0.0267	65.38	0.0264	66.83	0.0267	3199	0.4595	0.1151
4	66.36	0.0295	66.36	0.0293	66.36	0.0295	3201	0.5486	0.1345
5	64.44	0.0267	62.74	0.0263	64.44	0.0267	3180	0.4479	0.1126
Mean:	67.14	0.0306	65.15	0.0302	67.14	0.0306	3196	0.5303	0.1336
Standard Deviation:	1.95	0.0049	1.85	0.0046	1.95	0.0049	9	0.0752	0.0215

3 Point Flexural Test
ASTM D 790 M

3 point Flexural Test of Coir Fiber-UP Resin Composite-S.I. Units
ASTM Standard Test Method

Test type: Flexural 3 point bend

Instron Coporation
Series II Automated Materials Testing System 1.19
Test Date: 21 Apr 1993

Operator name: KONGSAK

Sample Identification: 50VP-P
Sample Type: ASTM
Interface Type: 4200 Series
Machine Parameters of test:
Sample Rate (pts/sec): 20.000
Humidity (%): 50
Crosshead Speed (mm/min): 1.3000
Temperature (deg. C): 25

Dimensions:

	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5
Width (mm)	26.20	25.85	26.15	25.65	25
Thickness (mm)	3.50	3.70	3.55	3.70	3.60
Span (mm)	50.00	50.00	50.00	50.00	50.00

Out of 5 specimens, 0 excluded.

Specimen Number	Stress at s-slp Yield (MPa)	Strain at s-slp Yield (mm/mm)	Stress at user Break (MPa)	Strain at user Break (mm/mm)	Stress at Cursor Point 1 (MPa)	Strain at Cursor Point 1 (mm/mm)	Modulus (ManYoung) (MPa)	Energy to Break Point (J)	Toughness (MPa)
1	54.02	0.0414	52.73	0.0400	54.02	0.0414	1947	0.7058	0.1539
2	51.45	0.0572	51.45	0.0659	51.45	0.0572	1654	1.3070	0.2733
3	53.97	0.0687	53.97	0.0669	53.97	0.0687	1662	1.1680	0.2516
4	51.46	0.0486	51.46	0.0474	51.46	0.0486	1780	0.7921	0.1669
5	52.93	0.0565	52.93	0.0561	52.93	0.0565	1660	0.9542	0.2120
Mean:	52.77	0.0545	52.51	0.0553	52.77	0.0545	1741	0.9854	0.2115
Standard Deviation:	1.27	0.0102	1.07	0.0117	1.27	0.0102	127	0.2516	0.0518

Sample	Specime Number	Energy to Break (J)	Width (mm)	Impact Strength (J/m)
PUP-I	1	0.038	2.80	13.571
	2	0.061	2.80	21.786
	3	0.055	2.80	19.643
	4	0.067	2.80	23.929
	5	0.035	2.75	12.727
Mean:		0.051	2.79	18.331
Standard Deviation:		0.013	0.02	4.451

Sample	Specime Number	Energy to Break (J)	Width (mm)	Impact Strength (J/m)
1NT-I	1	0.248	2.95	84.068
	2	0.230	2.95	77.966
	3	0.251	2.90	86.552
	4	0.234	2.90	80.690
	5	0.244	2.95	82.712
Mean:		0.241	2.93	82.397
Standard Deviation:		0.008	0.02	2.922
5NT-I	1	0.254	3.00	84.667
	2	0.267	2.90	92.069
	3	0.231	2.95	78.305
	4	0.245	2.95	83.051
	5	0.249	2.95	84.407
Mean:		0.249	2.95	84.500
Standard Deviation:		0.012	0.03	4.423
10NT-I	1	0.258	2.80	92.143
	2	0.260	2.85	91.228
	3	0.270	2.80	96.429
	4	0.231	2.80	82.500
	5	0.232	2.95	78.644
Mean:		0.250	2.84	88.189
Standard Deviation:		0.016	0.06	6.576
ONT-I	1	0.244	2.80	87.143
	2	0.248	2.85	87.018
	3	0.251	2.80	89.643
	4	0.240	2.80	85.714
	5	0.230	2.95	77.966
Mean:		0.243	2.84	85.497
Standard Deviation:		0.007	0.06	3.974

Sample	Specime Number	Energy to Break (J)	Width (mm)	Impact Strength (J/m)
1T2-I	1	0.345	3.00	115.000
	2	0.349	3.00	116.333
	3	0.352	3.00	117.333
	4	0.357	3.00	119.000
	5	0.348	2.95	117.966
Mean:		0.350	2.99	117.127
Standard Deviation:		0.004	0.02	1.372
5T2-I	1	0.351	3.00	117.033
	2	0.354	2.95	120.000
	3	0.350	3.00	116.667
	4	0.339	2.95	114.915
	5	0.337	2.95	114.237
Mean:		0.346	2.97	116.571
Standard Deviation:		0.007	0.02	2.008
10T2-I	1	0.350	2.95	118.644
	2	0.344	2.85	120.702
	3	0.343	2.95	116.271
	4	0.359	3.00	119.667
	5	0.330	2.85	115.789
Mean:		0.345	2.92	118.215
Standard Deviation:		0.009	0.347	3.00
OT2-I	1	0.347	3.00	115.667
	2	0.349	3.00	116.333
	3	0.350	2.95	118.644
	4	0.360	3.00	120.000
	5	0.333	3.00	111.000
Mean:		0.348	2.99	116.329
Standard Deviation:		0.009	0.02	3.088

Sample	Specimem Number	Energy to Break (J)	Width (mm)	Impact Strength (J/m)
1T5-I	1	0.401	2.95	135.93
	2	0.421	2.95	142.71
	3	0.405	3.00	135.00
	4	0.392	2.95	132.88
	5	0.395	2.97	133.00
Mean:		0.403	2.96	135.90
Standard Deviation:		0.010	0.02	3.60
5T5-I	1	0.398	2.75	144.73
	2	0.389	2.80	138.93
	3	0.422	2.80	150.71
	4	0.402	2.80	143.57
	5	0.404	2.80	144.29
Mean:		0.403	2.79	144.45
Standard Deviation:		0.011	0.02	3.76
10T5-I	1	0.410	2.70	151.85
	2	0.411	2.85	144.21
	3	0.397	3.00	132.33
	4	0.396	3.00	132.00
	5	0.397	2.85	139.30
Mean:		0.402	2.88	139.94
Standard Deviation:		0.007	0.11	7.50
OT5-I	1	0.410	2.80	146.43
	2	0.411	2.75	149.45
	3	0.397	2.80	141.79
	4	0.396	3.00	132.00
	5	0.397	2.80	141.79
Mean:		0.402	2.83	142.29
Standard Deviation:		0.007	0.09	5.91
1T8-I	1	0.435	2.85	152.63
	2	0.430	2.90	148.28
	3	0.440	2.95	149.15
	4	0.441	2.85	154.74
	5	0.401	2.80	143.21
Mean:		0.429	2.87	149.60
Standard Deviation:		0.015	0.05	3.96
5T8-I	1	0.434	2.95	147.12
	2	0.437	3.00	145.67
	3	0.438	2.90	151.03
	4	0.438	2.90	151.03
	5	0.400	2.90	137.93
Mean:		0.429	2.93	146.56
Standard Deviation:		0.002	0.04	2.38
10T8-I	1	0.439	3.00	146.33
	2	0.430	3.00	143.33
	3	0.441	3.00	147.00
	4	0.431	3.00	143.67
	5	0.422	3.00	140.67
Mean:		0.433	3.00	144.20
Standard Deviation:		0.005	0.00	1.61
OT8-I	1	0.436	3.00	145.33
	2	0.435	3.00	145.00
	3	0.429	2.95	145.42
	4	0.430	2.95	145.76
	5	0.441	2.85	154.74
Mean:		0.434	2.95	147.25
Standard Deviation:		0.003	0.02	0.27

Sample	Specimem Number	Energy to Break (J)	Width (mm)	Impact Strength (J/m)
1GF-I	1	0.845	2.70	312.96
	2	1.338	2.90	461.38
	3	0.996	2.75	362.18
	4	1.319	2.85	462.81
	5	1.270	2.70	470.37
Mean:		1.154	2.78	413.94
Standard Deviation:		0.488	1.12	170.07
5GF-I	1	1.352	2.90	466.21
	2	1.485	3.00	495.00
	3	1.531	2.85	537.19
	4	0.675	2.90	232.76
	5	2.960	3.00	986.67
Mean:		1.601	2.93	543.57
Standard Deviation:		0.345	0.05	118.22
10GF-I	1	2.171	2.85	761.75
	2	1.600	2.90	551.72
	3	2.103	3.00	701.00
	4	1.852	2.90	638.62
	5	1.852	2.90	638.62
Mean:		1.916	2.91	658.34
Standard Deviation:		0.225	0.05	77.74
CGF-I	1	0.675	2.85	236.84
	2	2.669	2.85	936.49
	3	1.116	2.85	391.58
	4	1.185	2.80	423.21
	5	1.549	2.85	543.51
Mean:		1.439	2.84	506.33
Standard Deviation:		0.752	0.02	263.34
10VP-I	1	0.370	3.00	123.33
	2	0.369	3.00	123.00
	3	0.365	3.00	121.67
	4	0.374	3.00	124.67
	5	0.368	3.00	122.67
Mean:		0.369	3.00	123.07
Standard Deviation:		0.003	0.00	1.07
30VP-I	1	0.571	3.15	181.27
	2	0.580	3.30	175.76
	3	0.566	3.10	182.58
	4	0.569	3.20	177.81
	5	0.570	3.30	172.73
Mean:		0.571	3.21	178.03
Standard Deviation:		0.005	0.07	2.71
40VP-I	1	0.570	3.00	190.00
	2	0.569	3.00	189.67
	3	0.565	3.00	188.33
	4	0.575	3.00	191.67
	5	0.576	3.00	192.00
Mean:		0.571	3.00	190.33
Standard Deviation:		0.004	0.00	1.19
50VP-I	1	0.705	3.25	216.92
	2	0.700	3.20	218.75
	3	0.714	3.25	219.69
	4	0.716	3.30	216.97
	5	0.708	3.40	208.24
Mean:		0.709	3.28	216.11
Standard Deviation:		0.007	0.04	1.19

APPENDIX B

Determination of Kappa Number of Pulp Method

Kappa Number of the coir fiber was performed according to Tappi T 236 cm-85.

CAUTION:
This method may require the use of some chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Material Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this test method, the user should determine whether any of the chemicals to be used are potentially hazardous and, if so, should follow strictly the procedures specified by both the manufacturer, as well as state and federal authorities, for safe use of these chemicals.

T 236 cm-85
TENTATIVE STANDARD—1960
OFFICIAL STANDARD—1976
CLASSICAL METHOD—1985

Kappa number of pulp

1. Scope and significance

This method applies to the determination of the relative hardness, bleachability, or degree of delignification of pulp. It may be used for all types and grades of chemical and semichemical, unbleached and semibleached pulps obtained in yields under 60%. This method may also be used for pulps obtained in yields up to 70%, provided the pulp has been well screened. See also Additional Information 10.5.

2. Definition

The *kappa number* is the volume (in milliliters) of 0.1*N* potassium permanganate solution consumed by one gram of moisture-free pulp under the conditions specified in this method. The results are corrected to 50% consumption of the permanganate added.

3. Apparatus

3.1 *Agitator*, of propeller type, made of glass or other noncorrosive material (a plastic or glass-covered magnetic stirrer may be used instead).

3.2 *Disintegration apparatus*, of wet, high-speed type, which disintegrates the pulp completely with a minimum of damage to the fibers. Avoid disintegrators that may contaminate the sample with grease.

3.3 *Constant temperature bath*, capable of maintaining a constant temperature of 25.0 ± 0.2°C in the reaction vessel.

3.4 *Reaction beaker*, 2000-mL, glass or porcelain.

3.5 *Pipets*, two 100-mL automatic pipets are especially convenient when a large number of determinations are to be made.

3.6 *Buret*, 50-mL, graduated to 0.1 mL. A 52-mL buret will be found more convenient for titrating the reaction mixture in the blank test.

3.7 *Other apparatus*: a Büchner funnel and filter flask to dewater three to four grams of pulp; stopwatch or clock; 1000-mL and a 25- or 50-mL graduated cylinder; 250-mL beaker.

4. Reagents

4.1 *Potassium permanaganate solution*, standardized 0.1000 ± 0.0005*N* $KMnO_4$.

4.2 *Sodium thiosulfate solution*, approximately 0.2*N* $Na_2S_2O_3$. Normality known with an accuracy of ±0.0005*N*.

4.3 *Potassium iodide solution*, 1.0*N* KI.

4.4 *Sulfuric acid*, 4*N* H_2SO_4.

4.5 *Starch indicator solution*, 0.2%.

5. Preparation of sample

5.1 *Air-dried pulp sheets*. Tear small pieces from the sample sheets to weigh a total of three to four grams.

5.2 *Screened slush sheets*. Mix and make three to four grams (dry weight) into a pad by filtering on a Büchner funnel; avoid any loss of fibers. Air-dry the pad and tear it into small pieces.

5.3 *Unscreened pulps*. If the pulp sample is taken from unscreened pulp which is normally screened before bleaching and other processing, then remove the shives and knots from the sample by screening. State method of screening along with the test results and choose the method which would give results similar to those obtained by the industrial screening of the pulp. Proceed as in 5.2.

6. Procedure

6.1 Prior to weighing the test samples, condition them for at least 20 min in the atmosphere near the balance.

6.2 Weigh out to the nearest 0.001 g that amount of pulp specimen which will consume approximately 50% of the potassium permanganate solution. The permanganate consumption must be between 30 and 70%. At the same time weigh out a second specimen and determine its moisture content in accordance with TAPPI T 210 "Sampling and Testing Wood Pulp Shipments for Moisture."

Approved by the Pulp Properties Committee of the Process and Product Quality Division TAPPI

6.3 Disintegrate the test specimen in 500 mL or less of distilled water until free of fiber clots and undispersed fiber bundles. Avoid methods of disintegration which involve extensive cutting of the fibers.

6.4 Transfer the disintegrated test specimen to a 2000-mL reaction beaker and rinse out the apparatus with enough distilled water to bring the total volume to 795 mL. The distilled water should be at least 25.0 ±0.2°C.

6.5 Place the beaker in a constant temperature bath adjusted so that the reaction temperature stays at 25.0 ± 0.2°C during the entire reaction. Continuously stir the suspension so as to produce a vortex about 25 mm deep but not fast enough to introduce air into the mixture (see 10.1).

6.6 Pipet 100.0 ± 0.1 mL of potassium permanganate solution and 100 mL of the sulfuric acid solution into a 250-mL beaker. Bring this mixture to 25°C quickly and add it immediately to the disintegrated test specimen, simultaneously starting a stopwatch. Rinse out the beaker, using not more than 5 mL of distilled water, and add the washings to the reaction mixture. The total volume should be 1000 ± 5 mL.

6.7 At the end of exactly 10.0 min, stop the reaction by adding 20 mL of the potassium iodide solution from a graduated cylinder.

6.8 Immediately after mixing, but without filtering out the fibers, titrate the free iodine with the sodium thiosulfate solution, adding a few drops of the starch indicator toward the end of the reaction (see 10.3).

6.9 Carry out a blank determination using exactly the same method as above but omitting the pulp (see 10.3).

7. Calculations

7.1 Calculate kappa number as follows:

$$K = \frac{p \times f}{w}$$

and

$$p = \frac{(b-a)N}{0.1}$$

where:

K = kappa number
f = factor for correction to a 50% permanganate consumption, dependent on the value of p (see Table 1)
w = weight of moisture-free pulp in the specimen, g
p = amount of 0.1N permanganate actually consumed by the test specimen, mL
b = amount of the thiosulfate consumed in the blank determination, mL
a = amount of the thiosulfate consumed by the test specimen, mL
N = normality of the thiosulfate

7.2 Factors in Table 1 are based on the equation: $\log K = \log p/w + 0.00093\ (p\text{-}50)$.

8. Report

8.1 Report the kappa number as follows:
8.1.1 Under 100, to the nearest 0.1.
8.1.2 Over 100, to the nearest whole number.

9. Precision

9.1 Repeatability is high for semibleached pulps but decreases with increasing kappa numbers and becomes fairly constant for kappa numbers above 20.

9.1.1 With semibleached pulps with kappa numbers below 20, the method will have a minimum repeatability of 0.2 kappa number. Repeatability decreases systematically from 13% for kappa numbers below 2 to 2.3% for kappa numbers between 10 and 20. The average repeatability is 3.8% for kappa numbers between 2.5 and 20.

9.1.2 With unbleached pulps with kappa numbers above 20, the repeatability varies unsystematically between 0.9 and 1.5%. The average repeatability is 1.2% for kappa numbers between 20 and 190.

10. Additional information

10.1 Effective date of issue: December 3, 1984.

10.2 This revision differs from the 1960 edition as follows: (a) a precision statement has been added; (b) the use of smaller quantities of specimen and reagents has been eliminated; and (c) the conversion table from 40 mL kappa numbers (T 214) to kappa numbers has been deleted.

10.3 Iodine volatization has been found to be an important variable in the kappa number determination. The timing between the reaction and subsequent titration completion should be as short as possible. Blank determina-

Table 1. Factors f to correct for different percentages of permanganate used

f +	0	1	2	3	4	5	6	7	8	9
30	0.958	0.960	0.962	0.964	0.966	0.968	0.970	0.973	0.975	0.977
40	0.979	0.981	0.983	0.985	0.987	0.989	0.991	0.994	0.996	0.998
50	1.000	1.002	1.004	1.006	1.009	1.011	1.013	1.015	1.017	1.019
60	1.022	1.024	1.026	1.028	1.030	1.033	1.035	1.037	1.039	1.042
70	1.044									

tions should duplicate the testing of the specimen as nearly as possible (omitting the pulp, of course).

10.4 *Correction for reaction temperature.* When a constant temperature bath is not available, determine the temperature after the reaction has been taking place for 5 min and assume this to be the average reaction temperature throughout the test. If this temperature is not higher than 30°C nor lower than 20°C, correct the kappa number as follows:

$$K = \frac{pf}{w}\left[1 + 0.013(25-t)\right]$$

where t = actual reaction temperature in degrees Celsius.

10.5 *Relationship with lignin.* The kappa number gives essentially a straight line relationship with both klason lignin and chlorine number for pulps below 70% total pulp yields (*1*). The percentage of klason lignin approximately equals $K \times 0.15$.

10.6 *Aging.* Freshly made pulp has a slightly higher permanganate consumption than pulp which has stood several days or months. The change is rather rapid immediately after the pulp is made but reaches a relatively stable stage after two or three days.

10.7 Related methods: APPITA P 201, "Kappa Number of Pulp," Technical Association of the Australian and New Zealand Pulp and Paper Industry, Parkville, Australia; CPPA G.18, "Kappa Number of Pulp," Canadian Pulp and Paper Association, Montreal, Canada; ISO R 302, "Determination of the Kappa Number of Pulp (Degree of Delignification)," International Organization for Standardization, Geneva, Switzerland; SCAN C1, "Kappa Number of Pulp" (essentially identical), Scandinavian Pulp, Paper and Board Testing Committee, Stockholm, Sweden.

10.8 This method, formerly T 236 os-76, has been reclassified as a Classical Method by the Test Methods Management Committee of the TAPPI Board of Directors. This reclassification was made necessary since the last revision was over five years ago and no revision or reaffirmation has been accomplished by the responsible committee. The method may be reclassified as Official or Provisional when the responsible committee takes proper action according to the "Guidelines for Effective Management, Coordination, Form and Style for TAPPI Test Methods."

Literature cited

1. Tasman, J. E., and Berzins, V., "The Permanganate Consumption of Pulp Materials," *Tappi* 40 (9): 691 (1957); *Pulp Paper Mag. Canada* 58(10): 145 (1957).

Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Test Methods Administrator. ■

VITA

Mr. Kongsak Dokbua was born on June 30, 1967 in Kanchanaburi, Thailand. He received his B.Sc. degree in Chemistry from the Faculty of Science, Kasetsart University in 1990 and he has been a graduate student in the Multidisciplinary Program of Petrochemistry-Polymer, Polymer Science Division, Graduate School, Chulalongkorn University in 1990.