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APPENDICES

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APPENDIX A

Characterization of Benzoxazine/Phenolic Novolac Alloys

Appendix A-1 Limiting oxygen index of BP alloys.

Phenolic Novolac Mass Fraction	Limiting Oxygen Index, LOI
0.0	30.1
0.1	30.7
0.2	30.8
0.3	31.0

Appendix A-2 Heat of combustion of BP alloys.

Phenolic Novolac Mass Fraction	Heat of Combustion, HOC (kJ/g)
0.0	34.95
0.1	34.43
0.2	34.30
0.3	33.82

Appendix A-3 Char yield of BP alloys.

Phenolic Novolac Mass Fraction	Char Yield (%)
0.0	25.05
0.1	34.28
0.2	36.27
0.3	36.89
0.5	38.47
0.7	37.48

Appendix A-4 Degradation temperature of BP alloys.

Phenolic Novolac Mass Fraction	Degradation Temperature, T_d ($^{\circ}\text{C}$)	
	5% weight loss	10% weight loss
0.0	334.17	355.04
0.1	353.46	368.25
0.2	349.81	374.44
0.3	345.87	371.65
0.5	326.39	356.57
0.7	307.55	341.04

Appendix A-5 Glass transition temperature of BP alloys.

Phenolic Novolac Mass Fraction	Glass-transition Temperature, T_g ($^{\circ}\text{C}$)
0.0	165.93
0.1	159.12
0.2	145.00
0.3	138.86
0.5	111.55

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APPENDIX B

Flammability Characterization of Woodflour-filled Benzoxazine/Phenolic Novolac Alloys

Appendix B-1 Limiting oxygen index of woodflour-filled BP alloys with 50%, 60%, and 70% by weight of woodflour content.

Phenolic Novolac Mass Fraction	Limiting Oxygen Index, LOI		
	50% by weight WF	60% by weight WF	70% by weight WF
0.0	25.2 ± 0.2	23.2 ± 0.1	22.8 ± 0.0
0.1	25.6 ± 0.4	23.6 ± 0.1	23.0 ± 0.1
0.2	25.5 ± 0.1	23.7 ± 0.1	23.3 ± 0.1
0.3	26.2 ± 0.1	23.9 ± 0.1	23.4 ± 0.1
0.5	27.1 ± 0.1	24.5 ± 0.1	23.7 ± 0.2
0.7	28.1 ± 0.1	26.2 ± 0.1	24.4 ± 0.1

Appendix B-2 Rate of burning of woodflour-filled BP alloys with 50% and 70% by weight of woodflour content.

Phenolic Novolac Mass Fraction	Rate of Burning (mm/min)	
	50% by weight WF	70% by weight WF
0.0	17.65 ± 0.4	18.06 ± 0.5
0.1	16.39 ± 0.8	17.38 ± 0.9
0.2	no burning rate	16.58 ± 0.7
0.3	no burning rate	16.16 ± 0.2
0.5	no burning rate	14.97 ± 1.2

Appendix B-3 Heat of combustion of woodflour-filled BP82.

Woodflour Content (%)	Heat of Combustion, HOC (kJ/g)
0	34.3
50	26.3
70	23.1
100	19.4



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APPENDIX C

Thermal Characterization of Woodflour-filled Benzoxazine/Phenolic Novolac Alloys

Appendix C-1 Degradation temperature of woodflour-filled BP alloys.

Phenolic Novolac Mass Fraction	Degradation Temperature, T_d ($^{\circ}\text{C}$)			
	50% by weightWF- 5% weight loss	50% by weightWF- 10% weight loss	70% by weightWF- 5% weight loss	70% by weightWF- 10% weight loss
0.0	279.66	304.71	271.19	289.55
0.1	287.81	310.63	275.43	294.69
0.2	289.66	312.86	274.64	295.88
0.3	290.21	312.57	276.92	297.88
0.5	289.99	313.09	279.48	298.61
0.7	285.64	313.39	270.17	293.92

Appendix C-2 Char yield of woodflour-filled BP alloys at 850°C with 50% and 70% by weight of woodflour content.

Phenolic Novolac Mass Fraction	Char Yield (%)	
	50% by weight WF	70% by weight WF
0.0	35.909	32.415
0.1	36.810	34.518
0.2	39.846	35.105
0.3	39.460	36.018
0.5	39.771	36.163
0.7	38.178	34.401

APPENDIX D

Mechanical Characterization of Woodflour-filled Benzoxazine/Phenolic Novolac Alloys

Appendix D-1 Flexural properties of woodflour-filled BP alloys.

Phenolic Novolac Mass Fraction	Flexural Modulus (GPa)		Flexural Strength (MPa)	
	50% by weight WF	70% by weight WF	50% by weight WF	70% by weight WF
0.0	5.8	6.1	60.3	59.3
0.1	5.7	6.1	61.3	58.5
0.2	6.4	6.4	64.5	57.8
0.3	5.3	6.0	65.6	62
0.5	5.5	6.1	65	69

Appendix D-2 Glass transition temperature of woodflour-filled BP alloys at 70% by weight of woodflour content.

Phenolic Novolac Mass Fraction	Glass-transition Temperature, T_g ($^{\circ}\text{C}$)
0.0	200
0.1	215
0.2	205

APPENDIX E

Physical Characterization of Woodflour-filled Benzoxazine/Phenolic Novolac Alloys

Appendix E-1 Density of woodflour-filled BP alloys at 50% by weight and 70% by weight of woodflour.

Wood Content	Phenolic Novolac Mass Fraction	Actual Density (g/cm ³)	Theoretical Density (g/cm ³)
50% by weight	0.0	1.32	1.33
	0.1	1.32	1.33
	0.2	1.32	1.34
	0.3	1.32	1.34
	0.5	1.33	1.35
	0.7	1.34	1.36
70% by weight	0.0	1.38	1.39
	0.1	1.37	1.39
	0.2	1.38	1.40
	0.3	1.36	1.40
	0.5	1.36	1.40
	0.7	1.37	1.41

Appendix E-2 Water absorption of woodflour-filled BP82 with 70% by weight of woodflour content.

Time	Water Absorption (%)
24 hours	3.11
7 days	10.20
saturation	16.12

VITA

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