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APPENDIXES

APPENDIX A

Tensile Data

Series 1 PLA/TPTS

Pure PLA			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	62.937	6.421	1666.667
2	61.900	6.689	1500.000
3	58.381	5.927	1700.680
Mean	61.073	6.346	1622.449
S.D.	2.388	0.387	107.399
5 wt% TPTS			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	48.391	4.494	1875.000
2	46.122	4.776	1527.778
3	48.407	4.181	1666.667
4	49.246	4.566	1700.680
Mean	48.042	4.504	1692.531
S.D.	1.341	0.246	142.798

10 wt% TPTS			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	57.862	4.941	1875.000
2	60.965	5.334	2000.000
3	58.316	5.268	2083.333
Mean	59.048	5.181	1986.111
S.D.	1.676	0.210	104.859
15 wt% TPTS			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	54.839	4.637	1875.000
2	56.039	4.136	2000.000
3	55.516	4.291	2037.037
4	60.123	4.718	2222.222
Mean	56.629	4.446	2033.565
S.D.	2.380	0.277	143.612
20 wt% TPTS			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	47.347	3.809	1875.000
2	50.490	3.861	2083.333
3	51.541	4.159	2037.037
Mean	49.793	3.943	1998.457
S.D.	2.182	0.189	109.394
25 wt% TPTS			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	45.235	3.861	1718.750
2	49.813	4.114	1666.667
3	48.255	3.719	1500.000
Mean	47.768	3.898	1628.472
S.D.	2.328	0.200	114.267

Series 2 RSP filled PLA/TPTS

5 wt% RSP			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	56.903	4.120	2000.000
2	61.568	4.516	2083.333
3	60.503	4.478	2291.667
Mean	59.658	4.371	2125.000
S.D.	2.445	0.218	150.232
10 wt% RSP			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	47.923	3.089	2441.077
2	50.845	3.608	2750.000
3	45.431	3.317	2666.667
Mean	48.066	3.338	2619.248
S.D.	2.710	0.260	159.827
15 wt% RSP			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	46.793	2.217	2583.333
2	43.752	2.254	2719.298
3	45.150	2.558	2430.556
Mean	45.232	2.343	2577.729
S.D.	1.522	0.187	144.453

20 wt% RSP			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	47.252	2.938	3000.000
2	44.456	2.492	3000.000
3	47.412	2.524	2819.298
Mean	46.373	2.651	2939.766
S.D.	1.662	0.249	104.328
25 wt% RSP			
	Tensile Strength (Mpa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	41.746	2.478	3166.667
2	39.712	2.387	2916.667
3	43.717	2.068	3000.000
Mean	41.725	2.311	3027.778
S.D.	2.003	0.215	127.294

APPENDIX B

Water Absorption

Date		15-03-16	15-03-16	15-03-16	15-03-16	16-03-16	17-03-16	18-03-16	21-03-16	28-03-16	04-04-16	11-04-16	13-04-16
Day		Initial	1	1	1	2	3	4	7	14	21	28	30

S1	PLA/TPTS												
TPTS (wt%)	Weight (g)												
0	A	2.3794	2.3841	2.3863	2.3888	2.3908	2.3932	2.3940	2.3958	2.3999	2.3436	2.4126	2.4141
	B	2.3999	2.4045	2.4061	2.4086	2.4099	2.4148	2.4163	2.4181	2.4222	2.4634	2.4367	2.4361
	C	2.3444	2.3499	2.3509	2.3530	2.3549	2.3580	2.3599	2.3617	2.3658	2.4065	2.3757	2.3788
	Mean	2.3746	2.3795	2.3811	2.3835	2.3852	2.3887	2.3901	2.3919	2.3960	2.4045	2.4083	2.4097
5	A	2.4622	2.4737	2.4746	2.4773	2.4912	2.5218	2.5226	2.5263	2.5294	2.5370	2.5391	2.5425
	B	2.4631	2.4750	2.4782	2.4809	2.4938	2.5147	2.5178	2.5215	2.5246	2.5308	2.5343	2.5391
	C	2.4110	2.4209	2.4260	2.4287	2.4385	2.4525	2.4572	2.4609	2.4640	2.4634	2.4639	2.4659
	Mean	2.4454	2.4565	2.4596	2.4623	2.4745	2.4963	2.4992	2.5029	2.5060	2.5104	2.5124	2.5158

Date		15-03-16	15-03-16	15-03-16	15-03-16	16-03-16	17-03-16	18-03-16	21-03-16	28-03-16	04-04-16	11-04-16	13-04-16
Day		Initial	1	1	1	2	3	4	7	14	21	28	30

S1	PLA/TPTS												
TPTS (wt%)	Weight (g)												
10	A	2.3988	2.4061	2.4095	2.4116	2.4216	2.4330	2.4335	2.4367	2.4403	2.4446	2.4486	2.4499
	B	2.3334	2.3411	2.3402	2.3423	2.3520	2.3621	2.3664	2.3696	2.3732	2.3744	2.3780	2.3812
	C	2.5354	2.5434	2.5473	2.5494	2.5587	2.5727	2.5745	2.5777	2.5813	2.5880	2.5951	2.5964
	Mean	2.4225	2.4302	2.4323	2.4344	2.4441	2.4559	2.4581	2.4613	2.4649	2.4690	2.4739	2.4758
15	A	2.4420	2.4515	2.4552	2.4584	2.4952	2.5426	2.5465	2.5517	2.5536	2.5628	2.5627	2.5659
	B	2.4069	2.4194	2.4210	2.4242	2.4580	2.4805	2.4843	2.4895	2.4914	2.4990	2.5003	2.5042
	C	2.4446	2.4558	2.4619	2.4651	2.4995	2.5360	2.5398	2.5450	2.5469	2.5644	2.5698	2.5737
	Mean	2.4312	2.4422	2.4460	2.4492	2.4842	2.5197	2.5235	2.5287	2.5306	2.5421	2.5443	2.5479
20	A	2.4872	2.5003	2.5076	2.5125	2.5406	2.5726	2.5753	2.5792	2.5812	2.5857	2.5963	2.5975
	B	2.5991	2.6177	2.6231	2.6280	2.6581	2.6941	2.6931	2.6970	2.6990	2.7088	2.7133	2.7139
	C	2.4843	2.4992	2.5042	2.5091	2.5476	2.6095	2.6138	2.6177	2.6197	2.6233	2.6258	2.6307
	Mean	2.5235	2.5391	2.5450	2.5499	2.5821	2.6254	2.6274	2.6313	2.6333	2.6393	2.6451	2.6474
25	A	2.5922	2.6130	2.6193	2.6282	2.6620	2.6947	2.6958	2.6974	2.7028	2.7014	2.7211	2.7263
	B	2.4555	2.4741	2.4822	2.4911	2.5139	2.5425	2.5462	2.5478	2.5532	2.5630	2.5675	2.5697
	C	2.6969	2.7169	2.7239	2.7328	2.7555	2.7886	2.7930	2.7946	2.8000	2.8062	2.8152	2.8202
	Mean	2.5815	2.6013	2.6085	2.6174	2.6438	2.6753	2.6783	2.6799	2.6853	2.6902	2.7013	2.7054

Date		15-03-16	15-03-16	15-03-16	15-03-16	16-03-16	17-03-16	18-03-16	21-03-16	28-03-16	04-04-16	11-04-16	13-04-16
Day		Initial	1	1	1	2	3	4	7	14	21	28	30

S2		RSP filled PLA/TPTS											
RSP (wt%)	Weight (g)												
	5	A	2.7356	2.7530	2.7585	2.7671	2.7987	2.8225	2.8400	2.8575	2.8625	2.8867	2.8920
B		2.6032	2.6235	2.6283	2.6369	2.6728	2.6975	2.7150	2.7337	2.7405	2.7676	2.7722	2.7810
C		2.7082	2.7283	2.7324	2.7410	2.7733	2.7972	2.8147	2.8315	2.8374	2.8625	2.8697	2.8762
Mean		2.6823	2.7016	2.7064	2.7150	2.7483	2.7724	2.7899	2.8076	2.8135	2.8389	2.8446	2.8521
10	A	2.7236	2.7474	2.7558	2.7665	2.8080	2.8387	2.8574	2.8803	2.8891	2.9260	2.9301	2.9373
	B	2.8926	2.9145	2.9203	2.9309	2.9649	2.9904	3.0091	3.0232	3.0389	3.0520	3.0525	3.0605
	C	2.8943	2.9191	2.9255	2.9362	2.9800	3.0125	3.0312	3.0582	3.0675	3.1061	3.1142	3.1219
	Mean	2.8368	2.8603	2.8672	2.8779	2.9176	2.9472	2.9659	2.9872	2.9985	3.0280	3.0323	3.0399
15	A	2.8270	2.8591	2.8690	2.8784	2.9480	2.9979	3.0336	3.0717	3.0780	3.1209	3.1247	3.1348
	B	2.7704	2.8073	2.8180	2.8274	2.9016	2.9576	2.9933	3.0382	3.0505	3.1055	3.1077	3.1221
	C	2.7586	2.7972	2.8061	2.8155	2.8939	2.9527	2.9884	3.0449	3.0582	3.1179	3.1179	3.1310
	Mean	2.7853	2.8212	2.8310	2.8404	2.9145	2.9694	3.0051	3.0516	3.0622	3.1148	3.1168	3.1293
20	A	2.7580	2.8006	2.8116	2.8295	2.9051	2.9739	3.0149	3.0662	3.0744	3.1010	3.1040	3.1044
	B	2.7245	2.7691	2.7827	2.8006	2.8936	2.9587	2.9997	3.0451	3.0492	3.0728	3.0745	3.0765
	C	2.7787	2.8210	2.8337	2.8516	2.9382	3.0045	3.0455	3.0940	3.1064	3.1257	3.1276	3.1293
	Mean	2.7537	2.7969	2.8093	2.8272	2.9123	2.9790	3.0200	3.0684	3.0767	3.0998	3.1020	3.1034
25	A	2.6422	2.6909	2.7063	2.7160	2.8243	2.8975	2.9101	2.9531	2.9592	2.9665	2.9774	2.9785
	B	2.6653	2.7326	2.7510	2.7607	2.8931	2.9793	2.9919	2.9984	3.0111	3.0146	3.0180	3.0272
	C	2.7623	2.8196	2.8375	2.8472	2.9817	3.0604	3.0730	3.0833	3.0913	3.0972	3.0990	3.1098
	Mean	2.6899	2.7477	2.7649	2.7746	2.8997	2.9791	2.9917	3.0116	3.0205	3.0261	3.0315	3.0385

Series 1 PLA/TPTS

Day	1	1	1	Avg 1	2	3	4	7	14	21	28	30
RSP (wt%)	Weight gain (g)											
0	0.0021	0.0028	0.0037	0.0029	0.0045	0.0059	0.0065	0.0073	0.0090	0.0126	0.0142	0.0148
5	0.0045	0.0058	0.0069	0.0057	0.0119	0.0208	0.0220	0.0235	0.0248	0.0266	0.0274	0.0288
10	0.0032	0.0040	0.0049	0.0040	0.0089	0.0138	0.0147	0.0160	0.0175	0.0192	0.0212	0.0220
15	0.0046	0.0061	0.0074	0.0060	0.0218	0.0364	0.0380	0.0401	0.0409	0.0456	0.0465	0.0480
20	0.0062	0.0085	0.0104	0.0084	0.0232	0.0404	0.0412	0.0427	0.0435	0.0459	0.0482	0.0491
25	0.0077	0.0104	0.0139	0.0107	0.0241	0.0363	0.0375	0.0381	0.0402	0.0421	0.0464	0.0480

Series 2 RSP filled PLA/TPTS

Day	1	1	1	Avg 1	2	3	4	7	14	21	28	30
RSP (wt%)	Weight gain (g)											
5	0.0072	0.0090	0.0122	0.0095	0.0246	0.0336	0.0401	0.0467	0.0489	0.0584	0.0605	0.0633
10	0.0083	0.0107	0.0145	0.0112	0.0285	0.0389	0.0445	0.0530	0.0570	0.0674	0.0689	0.0716
15	0.0129	0.0164	0.0198	0.0164	0.0464	0.0661	0.0789	0.0956	0.0994	0.1183	0.1190	0.1235
20	0.0157	0.0202	0.0267	0.0209	0.0576	0.0818	0.0967	0.1143	0.1173	0.1257	0.1265	0.1270
25	0.0215	0.0279	0.0315	0.0270	0.0780	0.1075	0.1122	0.1196	0.1229	0.1250	0.1270	0.1296

APPENDIX C

Tensile Test after Water Absorption

Series 1 PLA/TPTS

Pure PLA			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	47.476	3.451	2023.810
2	52.125	3.466	2121.212
3	49.148	3.126	2222.222
Mean	49.583	3.348	2122.415
S.D.	2.355	0.192	99.211
5 wt% TPTS			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	26.873	2.901	2000.000
2	29.589	2.432	1851.852
3	30.401	2.797	1759.259
Mean	28.954	2.710	1870.370
S.D.	1.848	0.246	121.434

10 wt% TPTS			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	27.250	2.556	1818.182
2	28.846	2.819	1666.667
3	31.287	2.357	1929.825
Mean	29.128	2.577	1804.891
S.D.	2.033	0.232	132.081
15 wt% TPTS			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	20.084	2.537	1250.000
2	23.428	2.649	1166.667
3	23.181	2.335	1388.889
Mean	22.231	2.507	1268.519
S.D.	1.863	0.159	112.262
20 wt% TPTS			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	17.247	2.067	1315.789
2	19.136	1.785	1500.000
3	15.981	1.777	1481.481
Mean	17.455	1.876	1432.423
S.D.	1.588	0.165	101.432
25 wt% TPTS			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	16.068	1.970	1315.789
2	12.895	1.529	1314.815
3	13.136	1.666	1333.333
Mean	14.033	1.722	1321.312
S.D.	1.766	0.226	10.422

Series 2 RSP filled PLA/TPTS

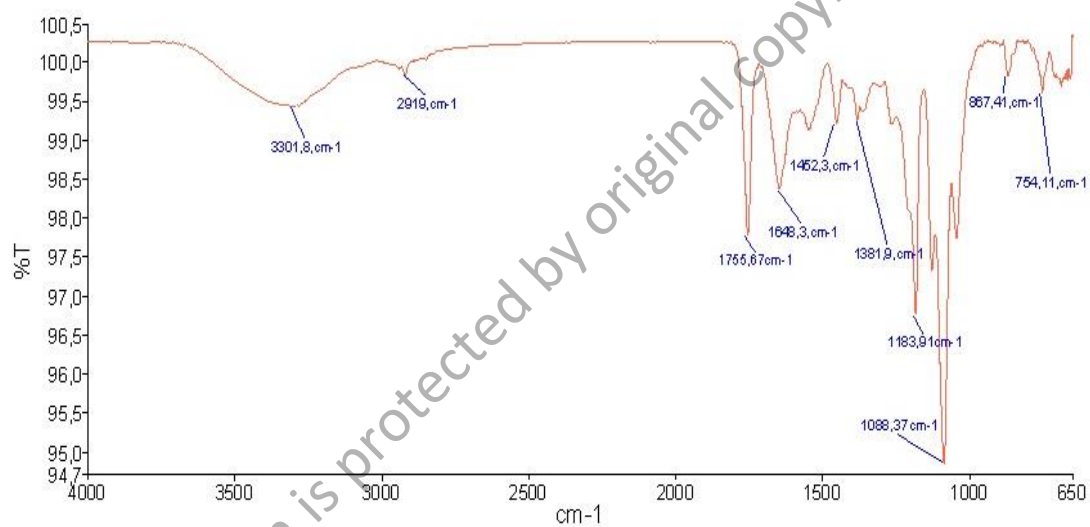
5 wt% RSP			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	39.016	4.386	1696.278
2	35.515	4.766	1519.028
3	38.270	4.589	1786.490
Mean	37.600	4.580	1667.265
S.D.	1.844	0.190	136.071
10 wt% RSP			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	33.165	3.209	2000.000
2	35.021	3.587	1833.333
3	33.288	3.154	1818.182
Mean	33.825	3.317	1883.838
S.D.	1.038	0.236	100.884
15 wt% RSP			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	28.444	3.600	1833.333
2	25.285	3.355	1818.182
3	24.645	3.519	2083.333
Mean	26.125	3.491	1911.616
S.D.	2.034	0.125	148.904

20 wt% RSP			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	23.228	3.041	1500.000
2	27.302	3.499	1527.778
3	25.018	3.411	1666.667
Mean	25.183	3.317	1564.815
S.D.	2.042	0.243	89.293
25 wt% RSP			
	Tensile Strength (MPa)	Elo. At Break (%)	Young's Modulus (Mpa)
1	23.518	3.360	2000.000
2	22.478	3.198	1875.000
3	23.361	2.915	1851.852
Mean	23.119	3.158	1908.951
S.D.	0.561	0.225	79.696

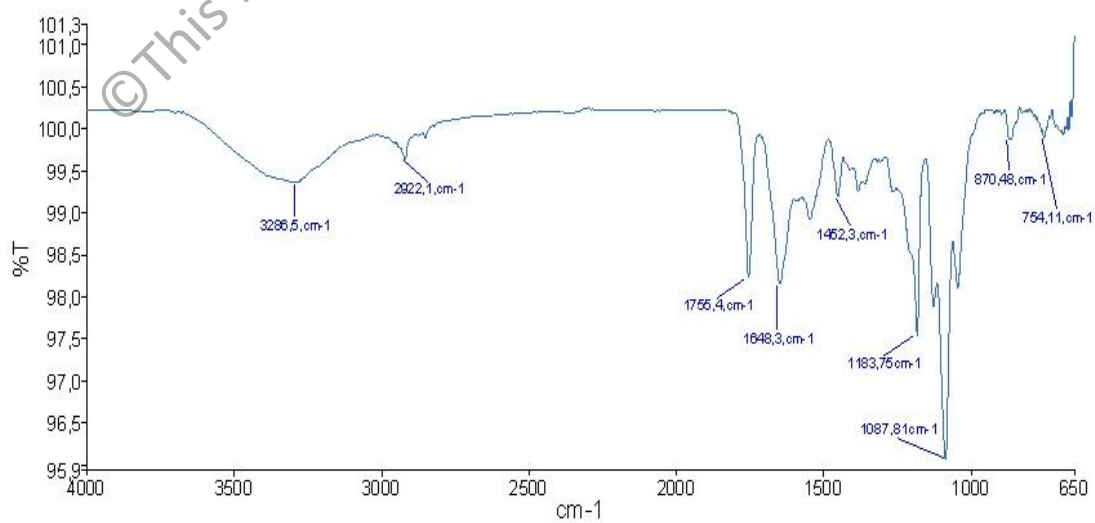
APPENDIX D

Fourier Transform Infrared (FTIR) Analysis

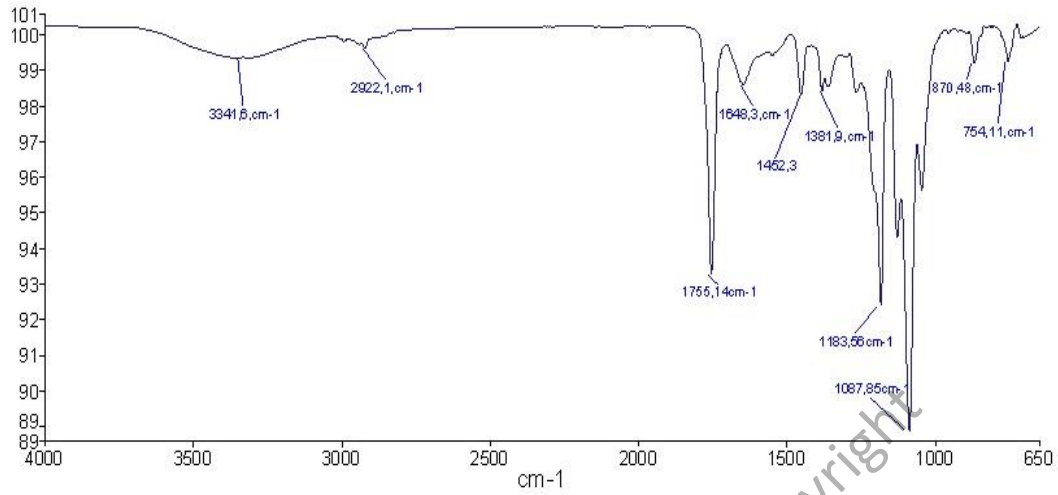
S1 5 wt% TPTS



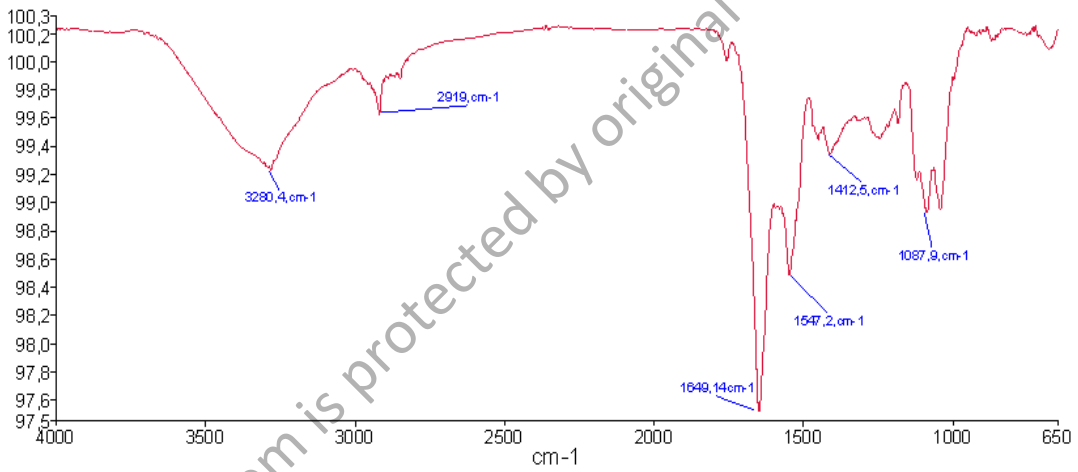
S1 10 wt% TPTS



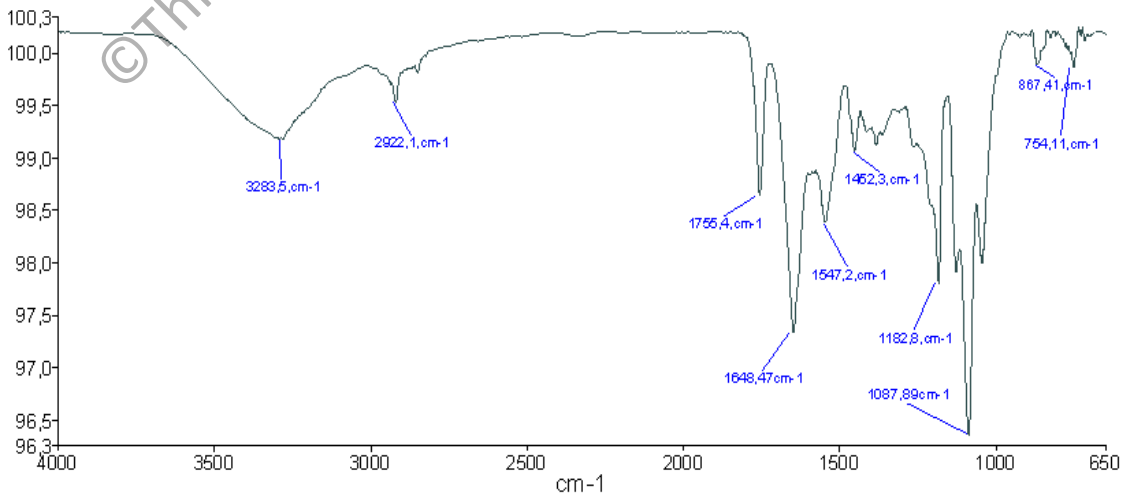
S1 15 wt% TPTS



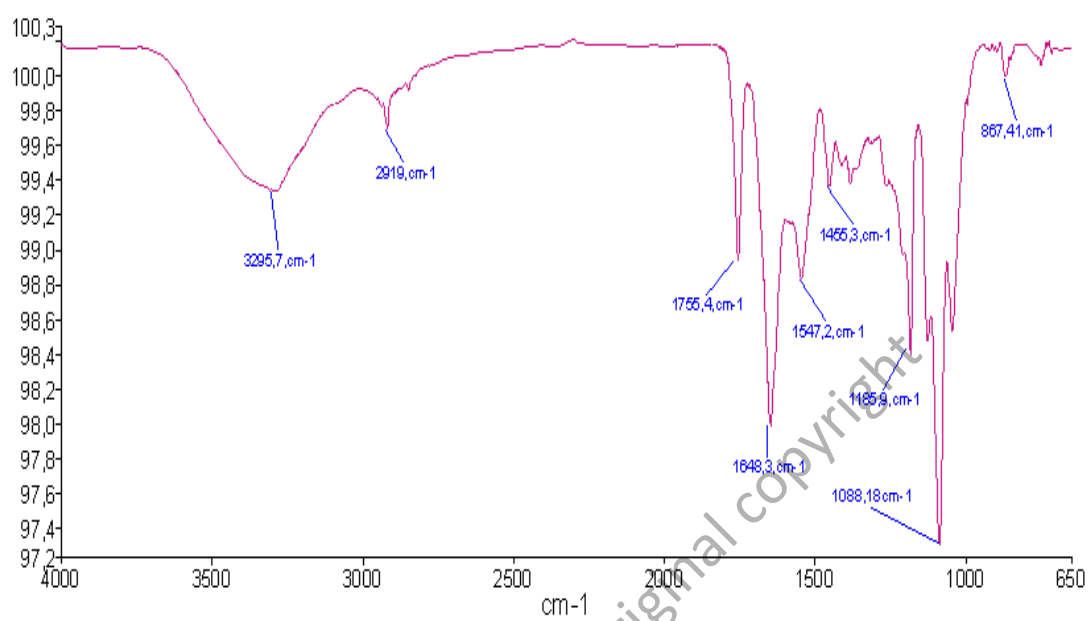
S1 25 wt% TPTS



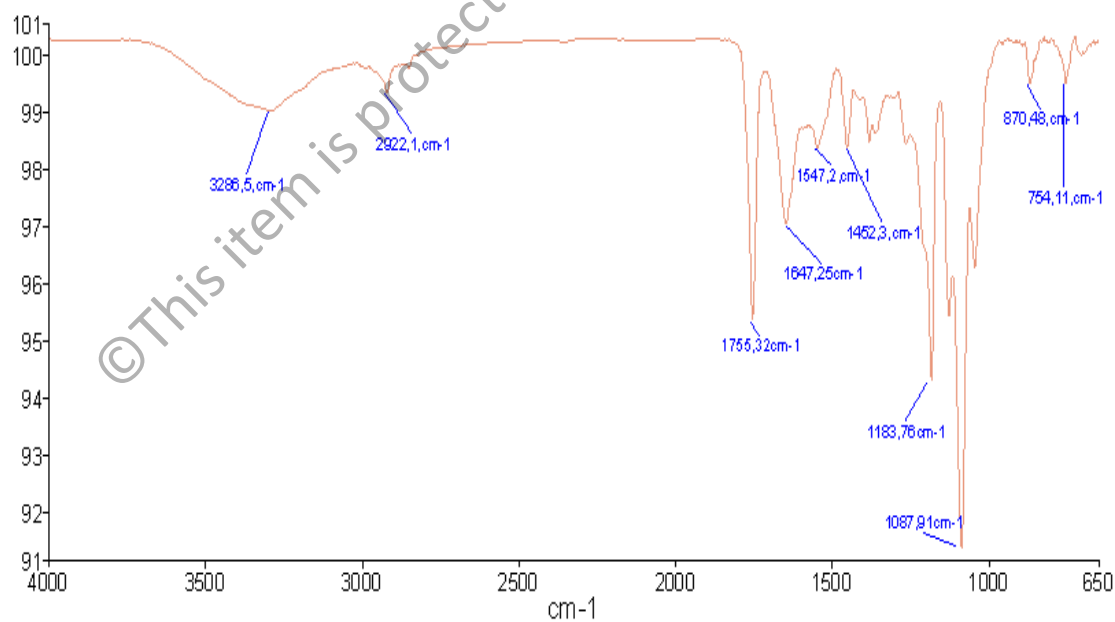
S2 5 wt% RSP



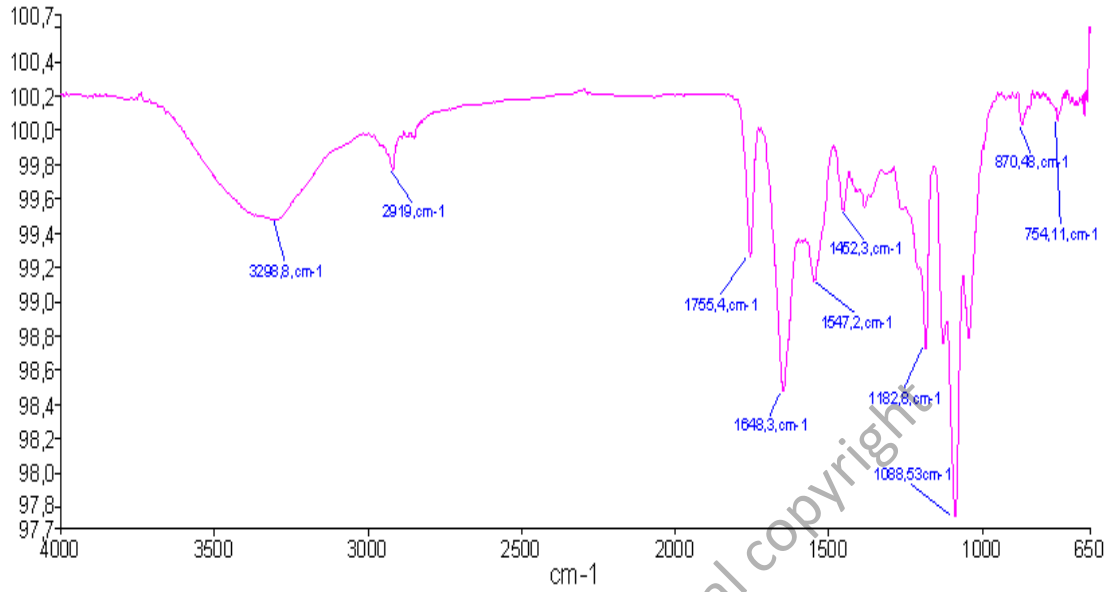
S2 10 wt% RSP



S2 15 wt% RSP



S2 25 wt% RSP



Overall Results

