

Table S1: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 350 °C, 1.0 atm, Reaction time=30 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		53.723
Styrene	9.728	100-42-5	9.547
Benzene, (1-methylethyl)-	10.710	98-82-8	4.194
Benzene, propyl-	11.688	103-65-1	0.220
α-Methylstyrene	12.584	98-83-9	6.413
Benzene, 1-propenyl-	14.092	637-50-3	0.521
Indene	14.849	95-13-6	0.267
Biphenyl	25.017	92-52-4	0.281
Diphenylmethane	26.329	101-81-5	0.586
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.485
Bibenzyl	28.688	103-29-7	0.427
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	12.752
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.244
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.677
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.268
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.541
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.767
Benzene, 1,1'-(1,1,2,2-tetramethyl-1,2-ethanediyl)bis-	34.748	1889-67-4	0.597
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.998
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.410
1H-Indene, 2-phenyl-	36.860	4505-48-0	0.270
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.492
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.773
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.471
p-Terphenyl	45.436	92-94-4	0.300
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.886
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.592
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	2.474
1,1':3',1''-Terphenyl, 5'-phenyl-	68.109	612-71-5	1.270
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		8.239
Naphthalene	19.491	91-20-3	0.556
Naphthalene, 1-methyl-	22.770	90-12-0	0.370
Naphthalene, 2-methyl-	23.259	91-57-6	0.472
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.600
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.314
Naphthalene, 1-phenyl-	36.578	605-02-7	2.056
Naphthalene, 2-phenyl-	40.019	612-94-2	1.958

Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.913
Nitrogenated Compounds	Σ(%area)		21.888
Benzyl nitrile	17.566	140-29-4	0.340
Benzeneacetonitrile, α-methyl-	18.434	1823-91-2	0.557
Benzenepropanenitrile	20.642	645-59-0	0.240
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.302
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.290
Benzenebutanenitrile	23.461	2046-18-6	11.716
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.630
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.539
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.174
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.269
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.171
Quinoline, 4-ethyl-	27.451	19020-26-9	0.320
Naphthalene, 1-isocyano- (cis)	28.187	-	0.913
Naphthalene, 1-isocyano- (trans)	28.899	-	0.561
1-Naphthaleneacetonitrile	32.306	132-75-2	0.964
Octadecanenitrile	43.043	638-65-3	0.743
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.670
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.804
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.324
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	50.370	163978-39-0	0.361
Brominated Compounds	Σ(%area)		0.741
Phenol, 2-bromo-	15.591	95-56-7	0.360
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.381
Oxygenated Compounds	Σ(%area)		12.843
Phenol	12.146	108-95-2	3.272
Phenol, 2-methyl-	14.630	95-48-7	0.589
Benzenemethanol, α-methyl-, (R)-	15.082	1517-69-7	0.267
Benzenemethanol, α,α-dimethyl-	15.904	617-94-7	1.400
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.380
p-Cumenol	20.028	99-89-8	4.554
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.180
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.475
As-Indacen-1(2H)-one, 3,6,7,8-tetrahydro-3,3,6,6-tetramethyl-	45.613	55591-18-9	0.847
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.785	1773-44-0	0.879
Non Identified fraction	Σ(%area)		2.562

Table S2: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 350 °C, 1.0 atm, Reaction time=45 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		46.065
Styrene	9.728	100-42-5	5.149
Benzene, (1-methylethyl)-	10.710	98-82-8	3.147
Benzene, propyl-	11.688	103-65-1	0.166
α -Methylstyrene	12.584	98-83-9	4.785
Benzene, 1-propenyl-	14.092	637-50-3	0.395
Biphenyl	25.017	92-52-4	0.243
Diphenylmethane	26.329	101-81-5	0.630
Benzene, 1,1'-ethylenedibis-	27.764	612-00-0	0.544
Bibenzyl	28.688	103-29-7	0.523
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	16.058
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.138
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.553
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.110
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.653
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.652
Benzene, 1,1'-(1,1,2,2-tetramethyl-1,2-ethanediyl)bis-	34.748	1889-67-4	0.577
Benzene, 1,1'-(2-methyl-1-propenylenedibis)-	34.898	781-33-9	1.617
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.472
1H-Indene, 2-phenyl-	36.860	4505-48-0	0.163
Benzene, 1,1'-[3-(2-phenylethylenedibis)-1,5-pentanediy]bis-	44.682	55334-57-1	1.411
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.432
p-Terphenyl	45.436	92-94-4	0.255
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.380
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.402
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.844
1,1':3',1''-Terphenyl, 5'-phenyl-	68.109	612-71-5	0.766
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		10.074
Naphthalene	19.491	91-20-3	0.515
Naphthalene, 1-methyl-	22.770	90-12-0	0.376
Naphthalene, 2-methyl-	23.259	91-57-6	0.482
Naphthalene, 1-isocyano- (cis)	28.187	-	1.228
Naphthalene, 1-isocyano- (trans)	28.899	-	0.554
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.633
Naphthalene, 1-phenyl-	36.578	605-02-7	2.530
Naphthalene, 2-phenyl-	40.019	612-94-2	1.727
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.443
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.586
Nitrogenated Compounds	Σ(%area)		23.439

Benzyl nitrile	17.566	140-29-4	0.321
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.609
Benzenepropanenitrile	20.642	645-59-0	0.282
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.635
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.285
Benzenebutanenitrile	23.461	2046-18-6	13.644
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.763
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.155
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.194
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.251
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.349
Quinoline, 4-ethyl-	27.451	19020-26-9	0.321
1-Naphthaleneacetonitrile	32.306	132-75-2	0.919
Octadecanenitrile	43.043	638-65-3	0.832
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.612
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.624
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.307
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.370	163978-39-0	0.336
Brominated Compounds	Σ(%.area)		0.600
Phenol, 2-bromo-	15.591	95-56-7	0.296
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.304
Oxygenated Compounds	Σ(%.area)		17.733
Phenol	12.146	108-95-2	4.980
Phenol, 2-methyl-	14.630	95-48-7	0.577
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.240
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.428
p-Cumenol	20.028	99-89-8	8.430
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.288
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.702
2,3-Dimethyl-1,4,4a,9a-tetrahydroanthracene-9,10-dione	37.226	2670-23-7	0.374
As-Indacen-1(2H)-one, 3,6,7,8-tetrahydro-3,3,6,6-tetramethyl-	45.613	55591-18-9	0.212
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.785	1773-44-0	0.502
Non identified fraction	Σ(%.area)		2.092

Table S3: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 350 °C, 1.0 atm, Reaction time=60 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		48.440
Styrene	9.728	100-42-5	7.678
Benzene, (1-methylethyl)-	10.710	98-82-8	4.467
Benzene, propyl-	11.688	103-65-1	0.212
α-Methylstyrene	12.584	98-83-9	5.289
Benzene, 1-propenyl-	14.092	637-50-3	0.435
Biphenyl	25.017	92-52-4	0.207
Diphenylmethane	26.329	101-81-5	0.639
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.515
Bibenzyl	28.688	103-29-7	0.493
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	16.254
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.151
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.589
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.236
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.707
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.616
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.314
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.503
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.370
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.379
p-Terphenyl	45.436	92-94-4	0.246
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.307
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.338
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.495
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		9.043
Naphthalene	19.491	91-20-3	0.473
Naphthalene, 1-methyl-	22.770	90-12-0	0.345
Naphthalene, 2-methyl-	23.259	91-57-6	0.455
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.274
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.633
Naphthalene, 1-phenyl-	36.578	605-02-7	2.549
Naphthalene, 2-phenyl-	40.019	612-94-2	1.719
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.422
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.533
Nitrogenated Compounds	Σ(%area)		23.644
Benzyl nitrile	17.566	140-29-4	0.327
Benzeneacetonitrile, α-methyl-	18.434	1823-91-2	0.578
Benzenepropanenitrile	20.642	645-59-0	0.276
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.612

Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.300
Benzenebutanenitrile	23.461	2046-18-6	13.413
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.806
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.244
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.229
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.170
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.351
Quinoline, 4-ethyl-	27.451	19020-26-9	0.285
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.563
1-Naphthaleneacetonitrile	32.306	132-75-2	0.933
Octadecanenitrile	43.043	638-65-3	0.744
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.646
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.582
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.279
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.370	163978-39-0	0.306
Brominated Compounds	Σ(%.area)		0.348
Phenol, 2-bromo-	15.591	95-56-7	0.212
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.136
Oxygenated Compounds	Σ(%.area)		15.680
Phenol	12.146	108-95-2	4.123
Phenol, 2-methyl-	14.630	95-48-7	0.539
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.567
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.414
p-Cumenol	20.028	99-89-8	7.365
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.287
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.542
2,3-Dimethyl-1,4,4a,9a-tetrahydroanthracene-9,10-dione	37.226	2670-23-7	0.334
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.785	1773-44-0	0.509
Non identified fraction	Σ(%.area)		2.092

Table S4: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 400 °C, 1.0 atm, Reaction time=15 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		50.222
Styrene	9.728	100-42-5	5.662
Benzene, (1-methylethyl)-	10.710	98-82-8	2.791
α -Methylstyrene	12.584	98-83-9	5.282
Benzene, 1-propenyl-	14.092	637-50-3	0.463
Indene	14.848	95-13-6	0.253
Biphenyl	25.017	92-52-4	0.313
Diphenylmethane	26.329	101-81-5	0.628
Benzene, 1,1'-ethylenedibis-	27.764	612-00-0	0.549
Bibenzyl	28.688	103-29-7	0.509
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	13.692
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.432
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.887
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.648
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.567
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.899
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	0.526
Benzene, 1,1'-(2-methyl-1-propenylenedibis)-	34.898	781-33-9	2.637
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.426
Benzene, 1,1'-[3-(2-phenylethylenedibis)-1,5-pentanediy]bis-	43.693	55334-57-1	0.712
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	2.046
Benzene, 1,1'-[3-(2-phenylethylenedibis)-1,5-pentanediy]bis-	44.682	55334-57-1	1.967
Benzene, (1-methylhexadecyl)-	45.093	55125-25-2	0.512
p-Terphenyl	45.430	92-94-4	0.298
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.968
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	2.555
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		7.515
Naphthalene	19.491	91-20-3	0.721
Naphthalene, 1-methyl-	22.770	90-12-0	0.403
Naphthalene, 2-methyl-	23.259	91-57-6	0.552
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.625
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.4
Naphthalene, 1-phenyl-	36.578	605-02-7	2.175
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	0.577
Naphthalene, 2-phenyl-	40.019	612-94-2	2.062
Nitrogenated Compounds	Σ(%area)		25.923
Benzonitrile	12.687	100-47-0	0.134
Benzyl nitrile	17.566	140-29-4	0.375
Benzeneacetoneitrile, α -methyl-	18.434	1823-91-2	0.658

Benzenepropanenitrile	20.642	645-59-0	0.298
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.36
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.339
Benzenebutanenitrile	23.461	2046-18-6	13.156
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.781
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.739
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.847	-	0.241
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.283
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.352
Quinoline, 4-ethyl-	27.451	19020-26-9	0.385
Naphthalene, 1-isocyano-	28.187	09/04/1984	0.949
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.582
1-Naphthaleneacetonitrile	32.306	132-75-2	1.018
N-(2-Phenylethyl)-cis-2,3-epoxynona-6,8-dynamide	34.586	96917-25-8	0.489
Octadecanenitrile	43.043	638-65-3	0.805
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.737
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.84
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.679	163978-39-0	0.283
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.378	163978-39-0	0.445
Acridine, 9-phenyl-	51.600	602-56-2	0.674
Brominated Compounds	Σ(%.area)		0.665
Phenol, 3-bromo-	15.590	591-20-8	0.315
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.350
Oxygenated Compounds	Σ(%.area)		12.889
Phenol	12.146	108-95-2	3.072
Phenol, 2-methyl-	14.630	95-48-7	0.7
Benzenemethanol, α -methyl-	15.081	98-85-1	0.327
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.556
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.428
p-Cumenol	20.028	99-89-8	4.53
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.311
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	1.005
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.781	1773-44-0	0.96
Non identified fraction	Σ(%.area)		2.784

Table S5: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 400 °C, 1.0 atm, Reaction time=30 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		56.934
Styrene	9.728	100-42-5	11.056
Benzene, (1-methylethyl)-	10.710	98-82-8	4.313
Benzene, propyl-	11.687	103-65-1	0.261
α-Methylstyrene	12.584	98-83-9	1.971
Benzene, 1-propenyl-	14.092	637-50-3	0.521
Biphenyl	25.017	92-52-4	0.266
Diphenylmethane	26.329	101-81-5	0.501
Benzene, 1,1'-ethylenedibis-	27.764	612-00-0	0.622
Bibenzyl	28.688	103-29-7	0.460
Benzene, 1,1'-(1,2-dimethyl-1,2-ethanediyl)bis-	29.185	5789-35-5	2.208
Benzene, 1,1'-(oxydiethylenedibis-	30.059	93-96-9	0.357
Benzene, 1,1'-(oxydiethylenedibis-	30.496	93-96-9	0.407
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	8.518
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.052
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.177
1,2-Diphenylcyclopropane	33.636	29881-14-9	1.936
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.357
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.492
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	5.481
Benzene, 1,1'-(2-methyl-1-propenylenedibis-	34.898	781-33-9	3.873
2,4-Diphenyl-4-methyl-2(E)-pentene	35.518	22768-22-5	3.868
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.701
Benzene, 1,1'-[3-(2-phenylethylenedibis)-1,5-pentanedibis]	43.693	55334-57-1	0.361
Benzene, 1,1'-[3-(2-phenylethylenedibis)-1,5-pentanedibis]	44.682	55334-57-1	0.756
Benzene, 1,1'-(1,1,2,2-tetramethyl-1,2-ethanediyl)bis-	48.270	-	1.291
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.271
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	1.125
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	53.070	52161-54-3	0.545
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	1.187
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		10.205
Naphthalene	19.491	91-20-3	0.629
Naphthalene, 1-methyl-	22.770	90-12-0	0.240
Naphthalene, 2-methyl-	23.259	91-57-6	0.509
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.448
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	2.504
Naphthalene, 1-phenyl-	36.578	605-02-7	1.738
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	1.308
Naphthalene, 2-phenyl-	40.019	612-94-2	1.536

Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.293
Nitrogenated Compounds	Σ(%.area)		18.264
Benzonitrile	12.687	100-47-0	0.061
Benzyl nitrile	17.566	140-29-4	0.284
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.426
Benzenepropanenitrile	20.642	645-59-0	0.249
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.337
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.289
Benzenebutanenitrile	23.461	2046-18-6	9.615
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133	-	0.943
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.147
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.255
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.288
Quinoline, 4-ethyl-	27.451	19020-26-9	0.330
Naphthalene, 1-isocyano-	28.187	09/04/1984	0.839
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.444
1-Naphthaleneacetonitrile	32.306	132-75-2	0.759
N-(2-Phenylethyl)-cis-2,3-epoxynona-6,8-diynamide	34.586	96917-25-8	0.309
Octadecanenitrile	43.043	638-65-3	0.576
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.320
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.331
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	49.679	163978-39-0	0.045
2-(4-Methoxy-2,6-dimethylphenyl)-3-methyl-2H-benzo[g]indazole	52.208	-	0.417
Brominated Compounds	Σ(%.area)		0.704
Phenol, 3-bromo-	15.590	591-20-8	0.336
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.368
Oxygenated Compounds	Σ(%.area)		11.623
Phenol	12.146	108-95-2	2.312
Phenol, 2-methyl-	14.630	95-48-7	0.179
Benzenemethanol, α -methyl-	15.081	98-85-1	0.707
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	0.275
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.184
p-Cumenol	20.028	99-89-8	3.317
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.181
Phenol, o-(α,α -dimethylbenzyl)-	33.107	18168-40-6	0.243
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	1.544
Benzenemethanol, 2,4,6-trimethyl- α -phenyl-	36.000	21945-75-5	0.275
Phenol, 4-(1-methyl-1-phenylethyl)-	36.122	599-64-4	1.027
2-tert-Butyl-6-(α -methylbenzyl)phenol	37.124	17959-02-3	0.418
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.781	1773-44-0	0.419
α -N-Normethadol	54.073	38455-85-5	0.542
Non identified fraction	Σ(%.area)		2.267

Table S6: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 400 °C, 1.0 atm, Reaction time=45 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		45.964
Styrene	9.728	100-42-5	5.664
Benzene, (1-methylethyl)-	10.710	98-82-8	2.864
Benzene, propyl-	11.687	103-65-1	0.178
α -Methylstyrene	12.584	98-83-9	5.220
Benzene, 1-propenyl-	14.092	637-50-3	0.516
Biphenyl	25.017	92-52-4	0.379
Diphenylmethane	26.329	101-81-5	0.720
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.417
Bibenzyl	28.688	103-29-7	0.684
Benzene, 1,1'-(1,2-dimethyl-1,2-ethanediyl)bis-	29.185	5789-35-5	0.551
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	11.875
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.617
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.650
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.968
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.492
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.187
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	2.256
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	2.726
2,4-Diphenyl-4-methyl-2(E)-pentene	35.518	22768-22-5	0.427
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.424
9-Phenyl-5H-benzocycloheptene	40.386	138089-71-1	0.541
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.003
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.378
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.374
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.853
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		11.092
Naphthalene	19.491	91-20-3	0.843
Naphthalene, 1-methyl-	22.770	90-12-0	0.373
Naphthalene, 2-methyl-	23.259	91-57-6	0.794
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.696
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.571
Naphthalene, 1-phenyl-	36.578	605-02-7	2.459
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	0.557
9,10-Dimethylantracene	37.560	781-43-1	0.307
Naphthalene, 2-phenyl-	40.019	612-94-2	2.601
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.891
Nitrogenated Compounds	Σ(%area)		27.880
Benzonitrile	12.687	100-47-0	0.068

Benzyl nitrile	17.566	140-29-4	0.445
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.692
Benzenepropanenitrile	20.642	645-59-0	0.337
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.580
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.476
Benzenebutanenitrile	23.461	2046-18-6	14.634
Cyclopropanecarbonitrile, 2-phenyl-, trans-	23.924	5590-14-7	0.272
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		1.060
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.802
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.229
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.435
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.475
(7-Isopropylidenebicyclo[2.2.1]hept-5-en-2-ylidene)acetonitrile	26.704	-	0.315
Quinoline, 4-ethyl-	27.451	19020-26-9	0.536
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.416
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.729
1-Naphthaleneacetonitrile	32.306	132-75-2	1.206
N-(2-Phenylethyl)-cis-2,3-epoxynona-6,8-diynamide	34.586	96917-25-8	0.440
Octadecanenitrile	43.043	638-65-3	0.751
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.484
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.498
Brominated Compounds	Σ(%.area)		0.510
Phenol, 3-bromo-	15.590	591-20-8	0.210
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.300
Oxygenated Compounds	Σ(%.area)		13.082
Phenol	12.146	108-95-2	3.227
Phenol, 2-methyl-	14.630	95-48-7	0.507
Benzenemethanol, α -methyl-	15.081	98-85-1	0.343
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.249
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.312
p-Cumenol	20.028	99-89-8	5.494
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.318
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	1.280
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.781	1773-44-0	0.352
Non identified fraction	Σ(%.area)		1.473

Table S7: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 400 °C, 1.0 atm, Reaction time=60 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		46.105
Styrene	9.728	100-42-5	3.944
Benzene, (1-methylethyl)-	10.710	98-82-8	2.178
α -Methylstyrene	12.584	98-83-9	3.877
Benzene, 1-propenyl-	14.092	637-50-3	0.329
Biphenyl	25.017	92-52-4	0.300
Diphenylmethane	26.329	101-81-5	0.744
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.795
Bibenzyl	28.688	103-29-7	0.672
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	15.312
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.780
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.131
1,2-Diphenylcyclopropane	33.636	29881-14-9	3.290
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.669
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.189
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	0.445
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	2.585
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.508
1H-Indene, 2-phenyl-	36.864	4505-48-0	0.107
9-Phenyl-5H-benzocycloheptene	40.386	138089-71-1	0.530
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.538
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.478
p-Terphenyl	45.432	92-94-4	0.255
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.473
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.398
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.861
1,1':3',1''-Terphenyl, 5'-phenyl-	68.111	612-71-5	0.717
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		10.007
Naphthalene	19.491	91-20-3	0.551
Naphthalene, 1-methyl-	22.770	90-12-0	0.301
Naphthalene, 2-methyl-	23.259	91-57-6	0.597
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.720
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.406
Naphthalene, 1-phenyl-	36.578	605-02-7	2.337
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	0.440
9,10-Dimethylanthracene	37.560	781-43-1	0.307
Naphthalene, 2-phenyl-	40.019	612-94-2	2.470
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.878
Nitrogenated Compounds	Σ(%area)		31.768

Pentanedinitrile, 2-methyl-	15.255	4553-62-2	0.238
Benzyl nitrile	17.566	140-29-4	0.400
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.678
Benzenepropanenitrile	20.642	645-59-0	0.342
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.490
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.474
Benzenebutanenitrile	23.461	2046-18-6	16.916
Cyclopropanecarbonitrile, 2-phenyl-, trans-	23.924	5590-14-7	0.303
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		1.113
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.426
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.299
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.462
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.512
(7-Isopropylidenebicyclo[2.2.1]hept-5-en-2-ylidene)acetonitrile	26.704	-	0.374
Quinoline, 4-ethyl-	27.451	19020-26-9	0.476
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.339
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.708
1-Naphthaleneacetonitrile	32.306	132-75-2	1.291
N-(2-Phenylethyl)-cis-2,3-epoxynona-6,8-diynamide	34.586	96917-25-8	0.504
Octadecanenitrile	43.043	638-65-3	0.645
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.667
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.656
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.232
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	50.370	163978-39-0	0.223
Brominated Compounds	Σ(%.area)		0.223
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.223
Oxygenated Compounds	Σ(%.area)		10.515
Phenol	12.146	108-95-2	2.369
Phenol, 2-methyl-	14.630	95-48-7	0.332
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.267
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.277
p-Cumenol	20.028	99-89-8	4.541
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.275
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.962
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.781	1773-44-0	0.492
Non identified fraction	Σ(%.area)		1.381

Table S8: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 450 °C, 1.0 atm, Reaction time=15 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		47.525
Styrene	9.728	100-42-5	4.957
Benzene, (1-methylethyl)-	10.710	98-82-8	3.168
α-Methylstyrene	12.584	98-83-9	4.604
Benzene, 1-propenyl-	14.092	637-50-3	0.355
Diphenylmethane	26.329	101-81-5	0.469
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.518
Bibenzyl	28.688	103-29-7	0.515
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	16.443
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.549
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.422
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.460
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.820
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.917
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	1.006
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	2.061
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.554
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.656
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.463
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.607
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.392
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	1.589
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		7.768
Naphthalene	19.491	91-20-3	0.385
Naphthalene, 1-methyl-	22.770	90-12-0	0.237
Naphthalene, 2-methyl-	23.259	91-57-6	0.441
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.617
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.361
Naphthalene, 1-phenyl-	36.578	605-02-7	2.360
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	0.340
Naphthalene, 2-phenyl-	40.019	612-94-2	1.493
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.534
Nitrogenated Compounds	Σ(%area)		26.578
Benzyl nitrile	17.566	140-29-4	0.276
Benzeneacetonitrile, α-methyl-	18.434	1823-91-2	0.586
Benzenepropanenitrile	20.642	645-59-0	0.285
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.588
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.277
Benzenebutanenitrile	23.461	2046-18-6	13.943

quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.833
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.166
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.314
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.261
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.352
(7-Isopropylidenebicyclo[2.2.1]hept-5-en-2-ylidene)acetonitrile	26.704	-	0.289
Quinoline, 4-ethyl-	27.451	19020-26-9	0.542
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.085
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.474
1-Naphthaleneacetonitrile	32.306	132-75-2	0.899
N-(2-Phenylethyl)-cis-2,3-epoxynona-6,8-diynamide	34.586	96917-25-8	0.410
Octadecanenitrile	43.043	638-65-3	0.918
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.724
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.635
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.337
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.370	163978-39-0	0.384
Brominated Compounds	Σ(%area)		0.662
Phenol, 2-bromo-	15.591	95-56-7	0.319
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.343
Oxygenated Compounds	Σ(%area)		15.965
Phenol	12.146	108-95-2	4.201
Phenol, 2-methyl-	14.630	95-48-7	0.468
Benzenemethanol, α-methyl-, (R)-	15.082	4553-62-2	0.385
Benzenemethanol, α,α-dimethyl-	15.904	617-94-7	1.260
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.316
p-Cumenol	20.028	99-89-8	7.066
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.358
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.988
Phenol, 4-(1-methyl-1-phenylethyl)-	36.125	599-64-4	0.297
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.781	1773-44-0	0.626
Non identified fraction	Σ(%area)		1.503

Table S9: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 450 °C, 1.0 atm, Reaction time=30 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		47.731
Styrene	9.728	100-42-5	6.633
Benzene, (1-methylethyl)-	10.710	98-82-8	4.235
α -Methylstyrene	12.584	98-83-9	5.511
Benzene, 1-propenyl-	14.092	637-50-3	0.443
Indene	14.849	95-13-6	0.276
Diphenylmethane	26.329	101-81-5	0.526
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.551
Bibenzyl	28.688	103-29-7	0.510
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	16.014
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.359
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.554
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.182
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.636
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.672
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	0.633
Benzene, 1,1'-(2-methyl-1-propenyldiene)bis-	34.898	781-33-9	1.455
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.521
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.329
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.431
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.288
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.335
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.637
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		9.732
Naphthalene	19.491	91-20-3	0.562
Naphthalene, 1-methyl-	22.770	90-12-0	0.358
Naphthalene, 2-methyl-	23.259	91-57-6	0.528
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.327
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.641
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.307
Naphthalene, 1-phenyl-	36.578	605-02-7	2.500
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	0.309
Naphthalene, 2-phenyl-	40.019	612-94-2	1.687
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.513
Nitrogenated Compounds	Σ(%area)		24.787
Benzyl nitrile	17.566	140-29-4	0.316
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.649
Benzenepropanenitrile	20.642	645-59-0	0.315
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.751

Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.310
Benzenebutanenitrile	23.461	2046-18-6	13.720
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.916
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.389
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.276
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.281
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.352
Quinoline, 4-ethyl-	27.451	19020-26-9	0.467
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.538
1-Naphthaleneacetonitrile	32.306	132-75-2	0.924
Octadecanenitrile	43.043	638-65-3	0.788
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.626
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.554
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.292
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.370	163978-39-0	0.323
Brominated Compounds	Σ(%.area)		0.316
Phenol, 2-bromo-	15.591	95-56-7	0.199
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.117
Oxygenated Compounds	Σ(%.area)		14.952
Phenol	12.146	108-95-2	3.775
Phenol, 2-methyl-	14.630	95-48-7	0.500
Benzenemethanol, α -methyl-, (R)-	15.082	4553-62-2	0.253
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.238
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.353
p-Cumenol	20.028	99-89-8	7.057
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.379
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.877
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.781	1773-44-0	0.520
Non identified fraction	Σ(%.area)		2.484

Table S10: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 450 °C, 1.0 atm, Reaction time=45 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		49.915
Styrene	9.728	100-42-5	9.088
Benzene, (1-methylethyl)-	10.710	98-82-8	4.689
Benzene, propyl-	11.688	103-65-1	0.240
α -Methylstyrene	12.584	98-83-9	6.649
Benzene, 1-propenyl-	14.092	637-50-3	0.547
Indene	14.849	95-13-6	0.458
Biphenyl	25.017	92-52-4	0.301
Diphenylmethane	26.329	101-81-5	0.600
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.572
Bibenzyl	28.688	103-29-7	0.474
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	14.528
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.243
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.361
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.146
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.649
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.577
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.054
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.482
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.465
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.482
p-Terphenyl	45.436	92-94-4	0.305
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.178
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.414
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.413
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		9.602
Naphthalene	19.491	91-20-3	0.851
Naphthalene, 1-methyl-	22.770	90-12-0	0.458
Naphthalene, 2-methyl-	23.259	91-57-6	0.710
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.679
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.242
Naphthalene, 1-phenyl-	36.578	605-02-7	2.621
Naphthalene, 2-phenyl-	40.019	612-94-2	2.234
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.807
Nitrogenated Compounds	Σ(%area)		26.166
Benzyl nitrile	17.566	140-29-4	0.381
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.731
Benzenepropanenitrile	20.642	645-59-0	0.348
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.694

Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.348
Benzenebutanenitrile	23.461	2046-18-6	13.460
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.865
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.372
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.218
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.306
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.324
Quinoline, 4-ethyl-	27.451	19020-26-9	0.381
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.408
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.727
1-Naphthaleneacetonitrile	32.306	132-75-2	1.055
Octadecanenitrile	43.043	638-65-3	0.653
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.730
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.630
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.286
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.370	163978-39-0	0.249
Brominated Compounds	Σ(%.area)		0.168
Phenol, 2-bromo-	15.591	95-56-7	0.096
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.072
Oxygenated Compounds	Σ(%.area)		11.687
Phenol	12.146	108-95-2	2.659
Phenol, 2-methyl-	14.630	95-48-7	0.510
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	0.826
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.362
p-Cumenol	20.028	99-89-8	5.613
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.341
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.893
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.781	1773-44-0	0.483
Non identified fraction	Σ(%.area)		2.462

Table S11: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 450 °C, 1.0 atm, Reaction time=60 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		47.045
Styrene	9.728	100-42-5	7.090
Benzene, (1-methylethyl)-	10.710	98-82-8	3.750
Benzene, propyl-	11.688	103-65-1	0.204
α -Methylstyrene	12.584	98-83-9	5.945
Benzene, 1-propenyl-	14.092	637-50-3	0.506
Indene	14.849	95-13-6	0.534
Biphenyl	25.017	92-52-4	0.398
Diphenylmethane	26.329	101-81-5	0.678
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.633
Bibenzyl	28.688	103-29-7	0.499
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	14.738
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.278
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.394
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.299
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.601
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.583
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.089
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.503
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanedyl]bis-	44.682	55334-57-1	1.468
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.463
p-Terphenyl	45.436	92-94-4	0.316
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.200
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	51.646	52161-54-3	0.486
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.390
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		11.197
Naphthalene	19.491	91-20-3	1.031
Naphthalene, 1-methyl-	22.770	90-12-0	0.576
Naphthalene, 2-methyl-	23.259	91-57-6	0.825
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.753
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.241
Naphthalene, 1-phenyl-	36.578	605-02-7	2.713
Naphthalene, 2-phenyl-	40.019	612-94-2	2.518
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.559
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.981
Nitrogenated Compounds	Σ(%area)		27.411
Benzyl nitrile	17.566	140-29-4	0.463
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.782
Benzenepropanenitrile	20.642	645-59-0	0.365

1,2-Benzenedicarbonitrile	21.230	91-15-6	0.699
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.433
Benzenebutanenitrile	23.461	2046-18-6	13.871
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.890
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.451
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.221
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.337
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.375
Quinoline, 4-ethyl-	27.451	19020-26-9	0.381
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.487
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.837
1-Naphthaleneacetonitrile	32.306	132-75-2	1.155
Octadecanenitrile	43.043	638-65-3	0.662
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.738
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.686
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.281
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	50.370	163978-39-0	0.297
Brominated Compounds	Σ(%.area)		0.162
Phenol, 2-bromo-	15.591	95-56-7	0.103
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.059
Oxygenated Compounds	Σ(%.area)		11.606
Phenol	12.146	108-95-2	2.642
Phenol, 2-methyl-	14.630	95-48-7	0.560
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	0.631
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.424
p-Cumenol	20.028	99-89-8	5.521
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.353
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	1.000
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.785	1773-44-0	0.475
Non identified fraction	Σ(%.area)		2.581

Table S12: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 500 °C, 1.0 atm, Reaction time=15 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		66.150
Styrene	9.731	100-42-5	10.183
α -Methylstyrene	12.585	98-83-9	4.406
Benzene, 1,1'-(1,3-propanediyl)bis-	32.086	1081-75-0	26.935
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.420	7614-93-9	4.077
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.601	1520-44-1	3.362
1,2-Diphenylcyclopropane	33.644	29881-14-9	4.144
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.388	7614-93-9	2.355
Benzene, 1,1'-(1,1,2,2-tetramethyl-1,2-ethanediyl)bis-	34.745	1889-67-4	2.194
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.908	781-33-9	8.494
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		3.511
1,9-Dihdropyrene	36.584	28862-02-4	3.511
Nitrogenated Compounds	Σ(%area)		13.450
Benzenebutanenitrile	23.450	2046-18-6	13.450
Oxygenated Compounds	Σ(%area)		16.889
Phenol	12.162	108-95-2	10.765
Phenol, 3-(1-methylethyl)-	20.040	618-45-1	6.124

Table S13: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 500 °C, 1.0 atm, Reaction time=30 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		52.762
Styrene	9.728	100-42-5	6.568
Benzene, (1-methylethyl)-	10.710	98-82-8	5.782
Benzene, 2-propenyl-	11.420	300-57-2	0.118
Benzene, propyl-	11.687	103-65-1	0.21
α-Methylstyrene	12.584	98-83-9	2.414
Benzene, 1-ethenyl-2-methyl-	12.919	611-15-4	0.122
Benzene, 1-propenyl-	14.092	637-50-3	0.371
Diphenylmethane	26.329	101-81-5	0.325
Bibenzyl	28.688	103-29-7	0.368
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	10.646
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.041
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.941
1,2-Diphenylcyclopropane	33.636	29881-14-9	1.617
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.445
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.353
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	5.009
Benzene, 1,1'-(2-methyl-1-propenyldiene)bis-	34.898	781-33-9	4.939
2,4-Diphenyl-4-methyl-2(E)-pentene	35.518	22768-22-5	3.963
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	43.694	55334-57-1	0.407
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.053
Benzene, (1-methylhexadecyl)-	45.093	55125-25-2	0.351
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	46.882	-	0.277
Benzene, 1,1'-(1,1,2,2-tetramethyl-1,2-ethanediyl)bis-	48.268	1889-67-4	0.971
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.306	-	0.458
Benzene, 1,1'-(1,4-dimethyl-1-butene-1,4-diyl)bis-	53.077	52161-54-3	0.437
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	1.576
Aliphatic Hydrocarbons	Σ(%area)		0.422
Pentadecane	27.477	629-62-9	0.422
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		9.686
Naphthalene	19.491	91-20-3	0.499
Naphthalene, 2-methyl-	23.259	91-57-6	0.239
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.445
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	1.94
Naphthalene, 1-phenyl-	36.578	605-02-7	2.006
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	2.982
Naphthalene, 2-phenyl-	40.019	612-94-2	0.545
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.03
Nitrogenated Compounds	Σ(%area)		14.489

Isobutyronitrile	3.319	78-82-0	0.058
Benzonitrile	12.687	100-47-0	0.053
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.343
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.339
Benzenebutanenitrile	23.450	2046-18-6	7.808
3-Benzyl-4,5-dihydro-3H-pyrrole	24.342	-	0.662
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.847	-	0.322
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.224
Naphthalene, 1-isocyano-	28.187	09/04/1984	0.6
1-Naphthaleneacetonitrile	32.306	132-75-2	0.531
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	35.167	-	0.487
Octadecanenitrile	43.043	638-65-3	1.061
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.363
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	49.681	163978-39-0	0.465
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	50.378	163978-39-0	0.566
2-(4-Methoxy-2,6-dimethylphenyl)-3-methyl-2H-benzo[g]indazole	52.204	-	0.607
Brominated Compounds	Σ(%.area)		0.456
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	1836-06-2	0.456
Oxygenated Compounds	Σ(%.area)		17.515
Ethyl Acetate	3.128	141-78-6	0.017
Phenol	12.146	108-95-2	3.229
Benzenemethanol, α -methyl-, (R)-	15.082	1517-69-7	0.617
p-Cumenol	20.028	99-89-8	4.335
Phenol, o-(α,α -dimethylbenzyl)-	33.109	18168-40-6	0.53
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	2.657
Phenol, 4-(1-methyl-1-phenylethyl)-	36.122	599-64-4	1.721
2-tert-Butyl-6-(α -methylbenzyl)phenol	37.124	17959-02-3	0.857
2,3-Dimethyl-1,4,4a,9a-tetrahydroanthracene-9,10-dione	49.741	2670-23-7	0.556
Phenol, 4-(1-methyl-1-phenylethyl)-	51.109	599-64-4	0.598
Phenol, 2,4-bis(1-phenylethyl)-	51.574	2769-94-0	1.918
4-(2-Methyl-1-cyclohexenyl)-trans-3-buten-2-one 2,4-dinitrophenylhydrazone	51.822	-	0.48
Non identified fraction	Σ(%.area)		4.670

Table S14: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 500 °C, 1.0 atm, Reaction time=45 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		49.938
Styrene	9.728	100-42-5	6.303
Benzene, (1-methylethyl)-	10.710	98-82-8	3.884
Benzene, propyl-	11.687	103-65-1	0.194
α -Methylstyrene	12.584	98-83-9	5.655
Benzene, 1-propenyl-	14.092	637-50-3	0.492
Diphenylmethane	26.329	101-81-5	0.644
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.486
Bibenzyl	28.688	103-29-7	0.504
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	16.286
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.548
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.802
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.62
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.702
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.995
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	0.554
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	2.892
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.546
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.44
Benzene, (1-methylhexadecyl)-	45.093	55125-25-2	0.457
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.306	-	0.351
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.583
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		8.596
Naphthalene	19.491	91-20-3	0.59
Naphthalene, 1-methyl-	22.770	90-12-0	0.305
Naphthalene, 2-methyl-	23.259	91-57-6	0.462
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.657
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.554
Naphthalene, 1-phenyl-	36.578	605-02-7	2.087
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	1.456
Naphthalene, 2-phenyl-	40.019	612-94-2	1.181
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.304
Nitrogenated Compounds	Σ(%area)		27.427
Benzyl nitrile	17.566	140-29-4	0.331
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.709
Benzenepropanenitrile	20.642	645-59-0	0.321
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.618
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.343
Benzenebutanenitrile	23.461	2046-18-6	15.693

Cyclopropanecarbonitrile, 2-phenyl-, trans-	23.927	5590-14-7	0.27
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		1.037
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.32
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.847	-	0.308
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.309
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.462
Quinoline, 4-ethyl-	27.451	19020-26-9	0.477
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.044
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.352
1-Naphthaleneacetonitrile	32.306	132-75-2	0.948
Octadecanenitrile	43.043	638-65-3	0.661
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.538
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.681	163978-39-0	0.324
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.378	163978-39-0	0.362
Brominated Compounds	Σ(%.area)		0.266
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	1836-06-2	0.266
Oxygenated Compounds	Σ(%.area)		12.966
Phenol	12.146	108-95-2	2.836
Phenol, 2-methyl-	14.630	95-48-7	0.532
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.371
p-Cumenol	20.028	99-89-8	6.225
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.401
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	1.386
Phenol, 4-(1-methyl-1-phenylethyl)-	36.122	599-64-4	0.215
Non identified fraction	Σ(%.area)		0.807

Table S15: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by thermal cracking of WEEE plastic at 500 °C, 1.0 atm, Reaction time=60 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		47.596
Styrene	9.728	100-42-5	6.379
Benzene, (1-methylethyl)-	10.710	98-82-8	3.546
Benzene, propyl-	11.687	103-65-1	0.205
α -Methylstyrene	12.584	98-83-9	4.996
Benzene, 1-propenyl-	14.092	637-50-3	0.52
Indene	14.848	95-13-6	0.326
Biphenyl	25.017	92-52-4	0.352
Diphenylmethane	26.329	101-81-5	0.743
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.597
Bibenzyl	28.688	103-29-7	0.571
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	14.826
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.534
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.487
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.931
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.663
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.926
2,4-Diphenyl-4-methyl-1-pentene	34.748	-	0.236
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	2.667
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.514
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.641
Benzene, (1-methylhexadecyl)-	45.093	55125-25-2	0.479
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.457
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		10.933
Naphthalene	19.491	91-20-3	1.008
Naphthalene, 1-methyl-	22.770	90-12-0	0.53
Naphthalene, 2-methyl-	23.259	91-57-6	0.699
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.759
Naphthalene, 1,2,3,4-tetrahydro-6-(phenylmethyl)-	35.372	35310-85-1	0.529
Naphthalene, 1-phenyl-	36.578	605-02-7	2.266
Naphthalene, 2,7-bis(1,1-dimethylethyl)-	37.221	10275-58-8	1.18
Naphthalene, 2-phenyl-	40.019	612-94-2	2.138
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.824
Nitrogenated Compounds	Σ(%area)		28.932
Benzyl nitrile	17.566	140-29-4	0.408
Benzeneacetoneitrile, α -methyl-	18.434	1823-91-2	0.777
Benzenepropanenitrile	20.642	645-59-0	0.376
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.548
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.432

Benzenebutanenitrile	23.461	2046-18-6	14.999
Cyclopropanecarbonitrile, 2-phenyl-, trans-	23.927	5590-14-7	0.267
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		1.044
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.42
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.847	-	0.279
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.355
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.435
Quinoline, 4-ethyl-	27.451	19020-26-9	0.454
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.114
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.754
1-Naphthaleneacetonitrile	32.306	132-75-2	1.174
Octadecanenitrile	43.043	638-65-3	0.567
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.694
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.683
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.679	163978-39-0	0.292
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.378	163978-39-0	0.326
Acridine, 9-phenyl-	51.600	602-56-2	0.534
Oxygenated Compounds	Σ(%area)		11.583
Phenol	12.146	108-95-2	2.039
Phenol, 2-methyl-	14.630	95-48-7	0.678
Benzenemethanol, α,α-dimethyl-	15.904	617-94-7	1.43
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.48
p-Cumenol	20.028	99-89-8	4.665
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.441
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	1.332
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.781	1773-44-0	0.518
Non identified fraction	Σ(%area)		0.953

Table S16: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 2.5%.wt of Si-Al ash pellets, Reaction time=30 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		45.614
Styrene	9.728	100-42-5	5.466
Benzene, (1-methylethyl)-	10.710	98-82-8	3.168
Benzene, propyl-	11.688	103-65-1	0.185
α -Methylstyrene	12.584	98-83-9	6.159
Benzene, 1-propenyl-	14.092	637-50-3	0.556
Indene	14.844	95-13-6	0.168
Benzene, n-butyl-	14.998	104-51-8	0.131
2,4-Dimethylstyrene	16.879	2234-20-0	0.170
Biphenyl	25.017	92-52-4	0.179
Diphenylmethane	26.329	101-81-5	0.624
Benzene, 1,1'-ethyldienebis-	27.764	612-00-0	0.571
Bibenzyl	28.688	103-29-7	0.566
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	16.178
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.712
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.120
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.245
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.653
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.957
Benzene, 1,1'-(2-methyl-1-propenyldiene)bis-	34.898	781-33-9	1.961
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.533
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	0.611
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.252
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.449
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		6.445
Naphthalene	19.491	91-20-3	0.586
Naphthalene, 1-methyl-	22.770	90-12-0	0.354
Naphthalene, 2-methyl-	23.259	91-57-6	0.576
Naphthalene, 1-isocyano-	28.187	09/04/1984	0.980
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.531
Naphthalene, 1-phenyl-	36.578	605-02-7	1.562
Naphthalene, 2-phenyl-	40.019	612-94-2	0.882
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.263
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	0.711
Nitrogenated Compounds	Σ(%area)		27.135
Cyclopentanecarbonitrile, 2-imino-	15.262	2321-76-8	0.268
Benzyl nitrile	17.566	140-29-4	0.454
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.780

Benzenepropanenitrile	20.642	645-59-0	0.299
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.480
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.375
Benzenebutanenitrile	23.461	2046-18-6	16.965
Cyclopropanecarbonitrile, 2-phenyl-, cis	23.922	5590-14-7	0.297
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.930
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.320
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.348
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.333
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.414
Quinoline, 4-ethyl-	27.451	19020-26-9	0.570
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	27.611		0.282
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.397
1-Naphthaleneacetonitrile	32.306	132-75-2	0.779
Octadecanenitrile	43.043	638-65-3	0.414
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.218
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.212
Brominated Compounds	Σ(%.area)		1.077
Phenol, 2-bromo-	15.591	95-56-7	0.465
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.612
Oxygenated Compounds	Σ(%.area)		16.916
Phenol	12.146	108-95-2	4.502
Phenol, 2-methyl-	14.630	95-48-7	0.503
Benzenemethanol, α -methyl-, (R)-	15.082	1517-69-7	0.297
Acetophenone	15.361	98-86-2	0.296
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.604
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.479
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.365
Phenol, 2,4,6-trimethyl-	18.614	527-60-6	0.325
p-Cumenol	20.028	99-89-8	7.351
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.348
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.846
Non identified fraction	Σ(%.area)		2.809

Table S17: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 2.5%.wt of Si-Al ash pellets, Reaction time=45 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%.area)		47.840
Styrene	9.728	100-42-5	5.756
Benzene, (1-methylethyl)-	10.710	98-82-8	3.077
Benzene, propyl-	11.688	103-65-1	0.175
α -Methylstyrene	12.584	98-83-9	4.292
Benzene, 1-propenyl-	14.092	637-50-3	0.414
Indene	14.844	95-13-6	0.164
2,4-Dimethylstyrene	16.879	2234-20-0	0.143
Biphenyl	25.017	92-52-4	0.159
Diphenylmethane	26.329	101-81-5	0.684
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.569
Bibenzyl	28.688	103-29-7	0.568
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	14.522
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.806
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.096
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.944
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.770
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.237
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	2.437
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.807
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.871
Benzene, (1-methylhexadecyl)-	45.090	55125-25-2	0.490
p-Terphenyl	45.435	92-94-4	0.304
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	46.879		0.173
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.732
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	1.650
Polycyclic aromatic hydrocarbons (PAH)	Σ(%.area)		10.010
Naphthalene	19.491	91-20-3	0.580
Naphthalene, 1-methyl-	22.770	90-12-0	0.352
Naphthalene, 2-methyl-	23.259	91-57-6	0.614
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.733
Naphthalene, 1-phenyl-	36.578	605-02-7	2.568
Naphthalene, 2-phenyl-	40.019	612-94-2	2.376
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.535
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	2.252
Nitrogenated Compounds	Σ(%.area)		27.253
Benzyl nitrile	17.566	140-29-4	0.296
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.557

Benzenepropanenitrile	20.642	645-59-0	0.306
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.357
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.316
Benzenebutanenitrile	23.461	2046-18-6	13.649
Cyclopropanecarbonitrile, 2-phenyl-, cis	23.922	5590-14-7	0.203
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.815
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.000
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.245
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.353
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.417
Quinoline, 4-ethyl-	27.451	19020-26-9	0.487
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	27.611		0.238
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.176
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.626
1-Naphthaleneacetoneitrile	32.306	132-75-2	1.290
N-(2-Phenylethyl)-cis-2,3-epoxynona-6,8-dynamide	34.585	96917-25-8	0.398
Octadecanenitrile	43.043	638-65-3	0.888
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.760
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.797
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.335
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	50.371	163978-39-0	0.356
Acridine, 9-phenyl-	51.607	602-56-2	0.388
Brominated Compounds	Σ(%.area)		0.431
Phenol, 2-bromo-	15.591	95-56-7	0.169
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.262
Oxygenated Compounds	Σ(%.area)		12.023
Phenol	12.146	108-95-2	2.776
Phenol, 2-methyl-	14.630	95-48-7	0.439
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	0.945
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.298
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.235
Phenol, 2,4,6-trimethyl-	18.614	527-60-6	0.170
p-Cumenol	20.028	99-89-8	5.085
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.251
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.492
2,3-Dimethyl-1,4,4a,9a-tetrahydroanthracene-9,10-dione	37.227	2670-23-7	0.274
As-Indacen-1(2H)-one, 3,6,7,8-tetrahydro-3,3,6,6-tetramethyl-	45.611	55591-18-9	0.424
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.779	1773-44-0	0.634
Non identified fraction	Σ(%.area)		2.436

Table S18: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 2.5%.wt of Si-Al ash pellets, Reaction time=60 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		45.883
Styrene	9.728	100-42-5	8.154
Benzene, (1-methylethyl)-	10.710	98-82-8	3.780
Benzene, propyl-	11.688	103-65-1	0.233
α-Methylstyrene	12.584	98-83-9	4.905
Benzene, 1-propenyl-	14.092	637-50-3	0.450
Indene	14.844	95-13-6	0.571
2,4-Dimethylstyrene	16.879	2234-20-0	0.129
Biphenyl	25.017	92-52-4	0.633
Diphenylmethane	26.329	101-81-5	0.752
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.745
1,1'-Biphenyl, 2-methyl-	28.049	643-58-3	0.216
Bibenzyl	28.688	103-29-7	0.473
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	9.005
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.334
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.415
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.807
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.597
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.890
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.615
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.602
1H-Indene, 2-phenyl-	36.866	4505-48-0	0.669
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.930
Benzene, (1-methylhexadecyl)-	45.090	55125-25-2	0.558
p-Terphenyl	45.435	92-94-4	0.475
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	46.879		0.316
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.551
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.991
1,1':3',1''-Terphenyl, 5'-phenyl-	68.104	612-71-5	1.087
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		18.410
Naphthalene	19.491	91-20-3	1.730
Naphthalene, 1-methyl-	22.770	90-12-0	0.848
Naphthalene, 2-methyl-	23.259	91-57-6	1.048
Naphthalene, 1-ethyl-	25.474	1127-76-0	0.270
Naphthalene, 1,8-dimethyl-	27.180	569-41-5	0.237
Naphthalene, 1-isocyano-	28.899	09/04/1984	1.032
Fluorene	30.718	86-73-7	0.476
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.813

Anthracene	35.143	120-12-7	1.307
Naphthalene, 1-phenyl-	36.578	605-02-7	2.860
Naphthalene, 2-phenyl-	40.019	612-94-2	4.129
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.687
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	2.973
Nitrogenated Compounds	Σ(%.area)		21.540
Benzonitrile	12.685	100-47-0	0.217
Benzyl nitrile	17.566	140-29-4	0.402
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.661
Benzenepropanenitrile	20.642	645-59-0	0.252
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.408
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.334
Benzenebutanenitrile	23.461	2046-18-6	9.121
Cyclopropanecarbonitrile, 2-phenyl-, cis	23.922	5590-14-7	0.165
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.652
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.435
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.163
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.394
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.281
Quinoline, 4-ethyl-	27.451	19020-26-9	0.346
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.412
1-Naphthaleneacetonitrile	32.306	132-75-2	1.447
N-(2-Phenylethyl)-cis-2,3-epoxynona-6,8-dynamide	34.585	96917-25-8	0.384
Octadecanenitrile	43.043	638-65-3	0.664
4-Methyl-3-(O-methylbenzyl)pentanenitrile	43.877	29107-40-2	0.674
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.853
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.309
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	50.371	163978-39-0	0.361
Acridine, 9-phenyl-	51.607	602-56-2	0.605
Brominated Compounds	Σ(%.area)		0.141
Phenol, 2-bromo-	15.591	95-56-7	0.089
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.052
Oxygenated Compounds	Σ(%.area)		11.405
Phenol	12.146	108-95-2	2.834
Phenol, 2-methyl-	14.630	95-48-7	0.459
p-Cresol	15.269	106-44-5	0.273
Benzenemethanol, α,α -dimethyl-	15.904	617-94-7	1.186
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.341
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.261
Phenol, 2,4,6-trimethyl-	19.614	527-60-6	0.188
p-Cumenol	20.028	99-89-8	3.755
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.257
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	1.177
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.779	1773-44-0	0.674

Non identified fraction	$\Sigma(\%.\text{area})$	2.620
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Table S19: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 5.0%.wt of Si-Al ash pellets, Reaction time=15 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		47.465
Styrene	9.728	100-42-5	8.932
Benzene, (1-methylethyl)-	10.710	98-82-8	4.078
Benzene, propyl-	11.688	103-65-1	0.225
α -Methylstyrene	12.584	98-83-9	7.309
Benzene, 1-propenyl-	14.092	637-50-3	0.563
Indene	14.844	95-13-6	0.388
Biphenyl	25.017	92-52-4	0.617
Diphenylmethane	26.329	101-81-5	0.666
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.669
1,1'-Biphenyl, 2-methyl-	28.049	643-58-3	0.186
Bibenzyl	28.688	103-29-7	0.396
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	9.263
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.070
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.310
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.060
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.472
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.738
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.467
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.441
1H-Indene, 2-phenyl-	36.866	4505-48-0	0.916
Benzene, (1-methylhexadecyl)-	43.882	55125-25-2	0.607
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	1.619
p-Terphenyl	45.435	92-94-4	0.599
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.302	-	0.513
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	1.143
1,1':3',1''-Terphenyl, 5'-phenyl-	68.116	612-71-5	1.218
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		18.127
1,2,3,4,5,8-Hexahydronaphthalene	15.001	36231-13-7	0.180
Naphthalene	19.491	91-20-3	1.403
Naphthalene, 1-methyl-	22.770	90-12-0	0.658
Naphthalene, 2-methyl-	23.259	91-57-6	0.841
Naphthalene, 1-ethyl-	25.474	1127-76-0	0.145
Naphthalene, 1,8-dimethyl-	27.180	569-41-5	0.136
Fluorene	30.718	86-73-7	0.489
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.743
Anthracene	35.143	120-12-7	1.524
Naphthalene, 1-phenyl-	36.578	605-02-7	2.985

Phenanthrene, 1-methyl-	38.620	832-69-9	0.596
Naphthalene, 2-phenyl-	40.019	612-94-2	4.577
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.697
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	3.153
Nitrogenated Compounds	Σ(%.area)		20.083
Benzonitrile	12.685	100-47-0	0.186
Benzyl nitrile	17.566	140-29-4	0.427
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.581
Benzenepropanenitrile	20.642	645-59-0	0.231
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.409
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.331
Benzenebutanenitrile	23.461	2046-18-6	9.085
Cyclopropanecarbonitrile, 2-phenyl-, cis	23.922	5590-14-7	0.152
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.554
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.267
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.144
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.772	5590-14-7	0.243
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.246
Quinoline, 4-ethyl-	27.451	19020-26-9	0.276
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.398
Naphthalene, 1-isocyano-	28.899	09/04/1984	1.161
1-Naphthaleneacetonitrile	32.306	132-75-2	1.351
Octadecanenitrile	43.052	638-65-3	0.541
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.445	-	0.792
Acridine, 9-phenyl-	51.605	602-56-2	0.708
Brominated Compounds	Σ(%.area)		0.664
Phenol, 2-bromo-	15.591	95-56-7	0.351
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.313
Oxygenated Compounds	Σ(%.area)		11.500
Phenol	12.146	108-95-2	3.767
Phenol, 2-methyl-	14.630	95-48-7	0.610
p-Cresol	15.269	106-44-5	0.366
Benzenemethanol, α,α -dimethyl-	15.909	617-94-7	0.220
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.388
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.295
Phenol, 2,4,6-trimethyl-	19.614	527-60-6	0.200
p-Cumenol	20.028	99-89-8	4.004
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	1.024
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.779	1773-44-0	0.626
Non identified fraction	Σ(%.area)		2.161

Table S20: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 5.0%.wt of Si-Al ash pellets, Reaction time=30 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		58.465
Styrene	9.728	100-42-5	18.688
Benzene, (1-methylethyl)-	10.710	98-82-8	8.985
Benzene, propyl-	11.688	103-65-1	0.502
α -Methylstyrene	12.584	98-83-9	11.920
Benzene, 1-propenyl-	14.092	637-50-3	0.888
Indene	14.844	95-13-6	0.334
Biphenyl	25.017	92-52-4	0.296
Diphenylmethane	26.329	101-81-5	0.553
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.450
Bibenzyl	28.688	103-29-7	0.343
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	9.166
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.009
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.224
1,2-Diphenylcyclopropane	33.636	29881-14-9	1.390
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.371
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.511
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	0.990
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.173
1H-Indene, 2-phenyl-	36.866	4505-48-0	0.184
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	0.488
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		7.207
1,2,3,4,5,8-Hexahydronaphthalene	15.001	36231-13-7	0.279
Naphthalene	19.491	91-20-3	0.861
Naphthalene, 1-methyl-	22.770	90-12-0	0.371
Naphthalene, 2-methyl-	23.259	91-57-6	0.592
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.368
Anthracene	35.143	120-12-7	0.475
Naphthalene, 1-phenyl-	36.578	605-02-7	1.313
Naphthalene, 2-phenyl-	40.019	612-94-2	1.629
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.241
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.078
Nitrogenated Compounds	Σ(%area)		18.675
Benzyl nitrile	17.566	140-29-4	0.430
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.735
Benzenepropanenitrile	20.642	645-59-0	0.309
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.318
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.294

Benzenebutanenitrile	23.461	2046-18-6	11.626
Cyclopropanecarbonitrile, 2-phenyl-, cis	23.922	5590-14-7	0.192
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.613
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.486
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.224
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.265
Quinoline, 4-ethyl-	27.451	19020-26-9	0.196
Naphthalene, 1-isocyano-	28.187	09/04/1984	0.800
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.505
1-Naphthaleneacetonitrile	32.306	132-75-2	0.682
Brominated Compounds	$\Sigma(\%.area)$		0.776
Phenol, 2-bromo-	15.591	95-56-7	0.388
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.388
Oxygenated Compounds	$\Sigma(\%.area)$		13.429
Phenol	12.146	108-95-2	4.719
Phenol, 2-methyl-	14.630	95-48-7	0.742
p-Cresol	15.269	106-44-5	0.362
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.466
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.364
Phenol, 2,4,6-trimethyl-	19.614	527-60-6	0.242
p-Cumenol	20.028	99-89-8	6.237
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.297
Non identified fraction	$\Sigma(\%.area)$		1.450

Table S21: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 5.0%.wt of Si-Al ash pellets, Reaction time=45 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		46.881
Styrene	9.728	100-42-5	6.593
Benzene, (1-methylethyl)-	10.710	98-82-8	3.696
Benzene, propyl-	11.688	103-65-1	0.232
α-Methylstyrene	12.584	98-83-9	4.729
Benzene, 1-propenyl-	14.092	637-50-3	0.489
Indene	14.844	95-13-6	0.228
Biphenyl	25.017	92-52-4	0.333
Diphenylmethane	26.329	101-81-5	0.678
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.605
Bibenzyl	28.688	103-29-7	0.589
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	13.455
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.605
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.275
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.809
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.763
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.051
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.965
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.605
1H-Indene, 2-phenyl-	36.866	4505-48-0	0.234
3-Methyl-1-phenyl-1H-indene	37.559	22360-63-0	0.369
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanedyl]bis-	44.682	55334-57-1	1.541
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.517
p-Terphenyl	45.435	92-94-4	0.373
1,1':4',1''-Terphenyl-, 3'-methyl-	47.282	33776-38-4	0.378
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.300		0.283
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.446		0.486
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		11.870
Naphthalene	19.491	91-20-3	0.805
Naphthalene, 1-methyl-	22.770	90-12-0	0.429
Naphthalene, 2-methyl-	23.259	91-57-6	0.638
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.719
Anthracene	35.143	120-12-7	0.620
Naphthalene, 1-phenyl-	36.578	605-02-7	2.632
Naphthalene, 2-phenyl-	40.019	612-94-2	2.993
1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.594
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	2.440
Nitrogenated Compounds	Σ(%area)		25.719

Benzyl nitrile	17.566	140-29-4	0.359
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.610
Benzenepropanenitrile	20.642	645-59-0	0.338
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.442
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.356
Benzenebutanenitrile	23.461	2046-18-6	13.133
Cyclopropanecarbonitrile, 2-phenyl-, cis	23.922	5590-14-7	0.241
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.876
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.019
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.223
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.766	5590-14-7	0.353
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.409
Quinoline, 4-ethyl-	27.451	19020-26-9	0.383
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.298
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.909
1-Naphthaleneacetonitrile	32.306	132-75-2	1.391
Octadecanenitrile	43.046	638-65-3	0.653
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.488		0.617
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.679	163978-39-0	0.375
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	50.372	163978-39-0	0.390
Acridine, 9-phenyl-	51.605	602-56-2	0.344
Brominated Compounds	Σ(%.area)		0.246
Phenol, 2-bromo-	15.591	95-56-7	0.137
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.109
Oxygenated Compounds	Σ(%.area)		13.074
Phenol	12.146	108-95-2	3.171
Phenol, 2-methyl-	14.630	95-48-7	0.527
p-Cresol	15.269	106-44-5	0.225
Benzenemethanol, α,α -dimethyl-	15.905	617-94-7	1.216
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.361
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.284
Phenol, 2,4,6-trimethyl-	19.614	527-60-6	0.230
p-Cumenol	20.028	99-89-8	5.620
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.250
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.617
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.779	1773-44-0	0.573
Non identified fraction	Σ(%.area)		2.211

Table S22: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 5.0%.wt of Si-Al ash pellets, Reaction time=60 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		44.566
Styrene	9.728	100-42-5	6.443
Benzene, (1-methylethyl)-	10.710	98-82-8	3.346
Benzene, propyl-	11.688	103-65-1	0.221
α-Methylstyrene	12.584	98-83-9	4.982
Benzene, 1-propenyl-	14.092	637-50-3	0.487
Indene	14.844	95-13-6	0.514
Biphenyl	25.017	92-52-4	0.539
Diphenylmethane	26.329	101-81-5	0.716
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.728
1,1'-Biphenyl, 2-methyl-	28.047	643-58-3	0.167
Bibenzyl	28.688	103-29-7	0.499
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	8.736
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.103
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.516
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.628
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.596
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.754
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.508
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.602
1H-Indene, 2-phenyl-	36.866	4505-48-0	0.600
3-Methyl-1-phenyl-1H-indene	37.559	22360-63-0	0.547
Benzene, 1,1'-[3-(2-phenylethylidene)-1,5-pentanediy]bis-	44.682	55334-57-1	2.303
Benzene, (1-methylhexadecyl)-	45.088	55125-25-2	0.764
p-Terphenyl	45.435	92-94-4	0.632
1,1':4',1''-Terphenyl-, 3'-methyl-	47.282	33776-38-4	0.540
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.300		0.240
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.446		0.496
1,1':2',1''-Terphenyl, 4'-phenyl-	57.602	1165-53-3	0.398
1,1':3',1''-Terphenyl, 5'-phenyl-	68.104	612-71-5	1.961
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		17.485
Naphthalene	19.491	91-20-3	1.389
Naphthalene, 1-methyl-	22.770	90-12-0	0.594
Naphthalene, 2-methyl-	23.259	91-57-6	0.954
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.881
Anthracene	35.143	120-12-7	0.974
Naphthalene, 1-phenyl-	36.578	605-02-7	3.175
Naphthalene, 2-phenyl-	40.019	612-94-2	4.835

1,2,3,4-Tetrahydro-1-phenyl-1,2,3-methanonaphthalene	40.387	138089-69-7	0.823
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	3.860
Nitrogenated Compounds	Σ(%.area)		22.946
Benzonitrile	12.685	100-47-0	0.203
Benzyl nitrile	17.566	140-29-4	0.449
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.640
Benzenepropanenitrile	20.642	645-59-0	0.306
1,2-Benzenedicarbonitrile	21.230	91-15-6	0.540
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.331
Benzenebutanenitrile	23.461	2046-18-6	8.627
Cyclopropanecarbonitrile, 2-phenyl-, cis	23.922	5590-14-7	0.188
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.685
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.430
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.104
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.766	5590-14-7	0.311
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.270
Quinoline, 4-ethyl-	27.451	19020-26-9	0.278
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.601
Naphthalene, 1-isocyano-	28.899	09/04/1984	1.418
1-Naphthaleneacetonitrile	32.306	132-75-2	1.696
Octadecanenitrile	43.046	638-65-3	0.618
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.488		1.017
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	49.679	163978-39-0	0.585
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahdro-2-amino-4-(4-methylphenyl)-	50.372	163978-39-0	0.627
Acridine, 9-phenyl-	51.605	602-56-2	1.022
Brominated Compounds	Σ(%.area)		0.023
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.023
Oxygenated Compounds	Σ(%.area)		11.145
Phenol	12.146	108-95-2	3.351
Phenol, 2-methyl-	14.630	95-48-7	0.595
p-Cresol	15.269	106-44-5	0.323
Benzenemethanol, α,α -dimethyl-	15.905	617-94-7	0.366
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.416
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.334
Phenol, 2,4,6-trimethyl-	19.614	527-60-6	0.216
p-Cumenol	20.028	99-89-8	3.516
Phenol, 2-methyl-5-(1-methylethyl)-	22.055	499-75-2	0.235
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.506
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.779	1773-44-0	1.287
Non identified fraction	Σ(%.area)		3.838

Table S23: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 7.5%.wt of Si-Al ash pellets, Reaction time=15 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		48.384
Styrene	9.728	100-42-5	7.386
Benzene, (1-methylethyl)-	10.710	98-82-8	5.087
Benzene, propyl-	11.688	103-65-1	0.489
α-Methylstyrene	12.584	98-83-9	7.406
Benzene, 1-propenyl-	14.092	637-50-3	0.681
Indene	14.844	95-13-6	0.393
Diphenylmethane	26.329	101-81-5	0.660
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.250
Bibenzyl	28.688	103-29-7	0.330
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	15.841
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	2.500
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	1.721
1,2-Diphenylcyclopropane	33.636	29881-14-9	1.726
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.616
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.144
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.750
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.404
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		5.168
Naphthalene	19.491	91-20-3	0.472
Naphthalene, 1-methyl-	22.770	90-12-0	0.261
Naphthalene, 2-methyl-	23.259	91-57-6	0.337
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.390
Naphthalene, 1-phenyl-	36.578	605-02-7	3.031
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	0.677
Nitrogenated Compounds	Σ(%area)		23.069
Benzyl nitrile	17.566	140-29-4	0.429
Benzeneacetonitrile, α-methyl-	18.434	1823-91-2	0.827
Benzenepropanenitrile	20.642	645-59-0	0.335
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.244
Benzenebutanenitrile	23.461	2046-18-6	14.906
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.822
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.531
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	1.662
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.384
Naphthalene, 1-isocyano-	28.187	09/04/1984	0.514
1-Naphthaleneacetonitrile	32.306	132-75-2	0.834
Octadecanenitrile	43.046	638-65-3	0.581

Brominated Compounds	Σ(%.area)		0.996
Phenol, 2-bromo-	15.591	95-56-7	0.520
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.476
Oxygenated Compounds	Σ(%.area)		19.591
Phenol	12.146	108-95-2	6.047
Phenol, 2-methyl-	14.630	95-48-7	0.903
Benzenemethanol, α -methyl-, (R)-	15.084	1517-69-7	0.364
p-Cresol	15.269	106-44-5	0.335
Benzenemethanol, α,α -dimethyl-	15.905	617-94-7	3.565
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.503
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.495
Phenol, 2,4,6-trimethyl-	19.614	527-60-6	0.353
p-Cumenol	20.028	99-89-8	6.698
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.328
Non identified fraction	Σ(%.area)		2.790

Table S24: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 7.5%.wt of Si-Al ash pellets, Reaction time=30 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		47.895
Styrene	9.728	100-42-5	5.944
Benzene, (1-methylethyl)-	10.710	98-82-8	3.805
Benzene, propyl-	11.688	103-65-1	0.240
α -Methylstyrene	12.584	98-83-9	5.985
Benzene, 1-propenyl-	14.092	637-50-3	0.579
Benzene, n-butyl-	14.999	104-51-8	0.192
1-Phenyl-1-butene	16.881	824-90-8	0.230
Diphenylmethane	26.329	101-81-5	0.348
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.184
Bibenzyl	28.688	103-29-7	0.560
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	16.847
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.920
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.243
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.115
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.700
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.316
2,4-Diphenyl-4-methyl-1-pentene	34.746		0.919
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	2.023
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.522
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.300		0.390
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	0.833
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		5.754
Naphthalene	19.491	91-20-3	0.543
Naphthalene, 1-methyl-	22.770	90-12-0	0.325
Naphthalene, 2-methyl-	23.259	91-57-6	0.475
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.524
Naphthalene, 1-phenyl-	36.578	605-02-7	2.901
Naphthalene, 2-phenyl-	40.017	612-94-2	0.395
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	0.591
Nitrogenated Compounds	Σ(%area)		26.138
Benzyl nitrile	17.566	140-29-4	0.420
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.820
Benzenepropanenitrile	20.642	645-59-0	0.384
1,2-Benzenedicarbonitrile	21.233	91-15-6	0.333
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.317
Benzenebutanenitrile	23.461	2046-18-6	17.247
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.977

3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	2.040
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.296
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.768	5590-14-7	0.491
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.648
Naphthalene, 1-isocyano-	28.187	09/04/1984	0.684
1-Naphthaleneacetonitrile	32.306	132-75-2	0.689
Octadecanenitrile	43.046	638-65-3	0.792
Brominated Compounds	Σ(%.area)		0.565
Phenol, 2-bromo-	15.591	95-56-7	0.290
5-Bromo-2-methoxy-1,3-dimethylbenzene	23.559	-	0.275
Oxygenated Compounds	Σ(%.area)		17.248
Phenol	12.146	108-95-2	4.751
Phenol, 2-methyl-	14.630	95-48-7	0.743
p-Cresol	15.269	106-44-5	0.366
Benzenemethanol, α,α -dimethyl-	15.905	617-94-7	1.479
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.471
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.390
Phenol, 2,4,6-trimethyl-	19.614	527-60-6	0.359
p-Cumenol	20.028	99-89-8	8.025
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.333
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.779	1773-44-0	0.331
Non identified fraction	Σ(%.area)		2.397

Table S25: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 7.5%.wt of Si-Al ash pellets, Reaction time=45 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		47.737
Styrene	9.728	100-42-5	6.400
Benzene, (1-methylethyl)-	10.710	98-82-8	3.868
Benzene, propyl-	11.688	103-65-1	0.227
α -Methylstyrene	12.584	98-83-9	4.881
Benzene, 1-propenyl-	14.092	637-50-3	0.443
Diphenylmethane	26.329	101-81-5	0.477
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.308
Bibenzyl	28.688	103-29-7	0.542
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	15.362
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	1.731
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.380
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.852
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.833
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	1.307
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	2.097
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.755
Benzene, (1-methylhexadecyl)-	43.880	55125-25-2	1.146
p-Terphenyl	45.433	92-94-4	0.298
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	49.300		0.729
1-Propene, 3-(2-cyclopentenyl)-2-methyl-1,1-diphenyl-	53.449	-	1.101
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		10.210
Naphthalene	19.491	91-20-3	0.442
Naphthalene, 1-methyl-	22.770	90-12-0	0.253
Naphthalene, 2-methyl-	23.259	91-57-6	0.386
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.686
Naphthalene, 1-phenyl-	36.578	605-02-7	5.094
Naphthalene, 2-phenyl-	40.017	612-94-2	1.356
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.993
Nitrogenated Compounds	Σ(%area)		23.199
Benzyl nitrile	17.566	140-29-4	0.207
Benzeneacetonitrile, α -methyl-	18.434	1823-91-2	0.501
Benzenepropanenitrile	20.642	645-59-0	0.307
1,2-Benzenedicarbonitrile	21.233	91-15-6	0.257
Cyclopropanecarbonitrile, 2-phenyl-, trans-	22.408	5590-14-7	0.197
Benzenebutanenitrile	23.461	2046-18-6	11.814
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.668
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.524

1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.343
Cyclopropanecarbonitrile, 2-phenyl-, trans-	25.768	5590-14-7	0.228
1H-Pyrrole, 1-(4-methylphenyl)-	26.122	827-60-1	0.346
Naphthalene, 1-isocyano-	28.187	09/04/1984	0.858
Naphthalene, 1-isocyano-	28.899	09/04/1984	0.302
1-Naphthaleneacetonitrile	32.306	132-75-2	1.033
Tricyclo[4.3.3.0(1,6)]dodeca-7,11-diene-7,12-dicarbonitrile	38.978	119657-40-8	0.257
Octadecanenitrile	43.046	638-65-3	2.002
(1-Benzyl-2-O-tolyl-ethyl)-isonitrile	44.449		1.195
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.731
Acridine, 9-phenyl-	51.605	602-56-2	0.429
Oxygenated Compounds	Σ(%.area)		12.002
Phenol	12.146	108-95-2	2.855
Phenol, 2-methyl-	14.630	95-48-7	0.423
Benzenemethanol, α,α -dimethyl-	15.905	617-94-7	0.979
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.272
Phenol, 2,4-dimethyl-	17.684	105-67-9	0.195
Phenol, 2,4,6-trimethyl-	19.614	527-60-6	0.154
p-Cumenol	20.028	99-89-8	4.759
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.346
3-Pentanone, 1,5-diphenyl-	36.946	5396-91-8	0.369
2,3-Dimethyl-1,4,4a,9a-tetrahydroanthracene-9,10-dione	37.227	2670-23-7	0.323
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.779	1773-44-0	1.327
Non identified fraction	Σ(%.area)		6.852

Table S26: Classes of compounds, summation of peak areas, CAS number, and retention times of chemical compounds identified by GC-MS in bio-oil by catalytic upgrading of WEEE plastic pyrolysis vapors at 450 °C, 1.0 atm, on a fixed catalyst bed loaded with 7.5%.wt of Si-Al ash pellets, Reaction time=60 min, in semi-pilot scale two-stage reactor of 2.0 L.

Chemical Compound	RT (min)	CAS	wi(%Area)
Aromatic Hydrocarbons	Σ(%area)		54.202
Styrene	9.728	100-42-5	9.689
Benzene, (1-methylethyl)-	10.710	98-82-8	5.744
Benzene, propyl-	11.688	103-65-1	0.318
α-Methylstyrene	12.584	98-83-9	7.672
Benzene, 1-propenyl-	14.092	637-50-3	0.624
Benzene, 1-ethynyl-4-methyl-	14.857	766-97-2	0.440
Biphenyl	25.023	92-52-4	0.594
Diphenylmethane	26.329	101-81-5	0.681
Benzene, 1,1'-ethylidenebis-	27.764	612-00-0	0.677
Bibenzyl	28.688	103-29-7	0.525
Benzene, 1,1'-(1,3-propanediyl)bis-	32.085	1081-75-0	15.732
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	32.412	7614-93-9	2.083
Benzene, 1,1'-(1-methyl-1,3-propanediyl)bis-	32.600	1520-44-1	2.111
1,2-Diphenylcyclopropane	33.636	29881-14-9	2.747
Benzene, 1,1'-(1,4-butanediyl)bis-	34.021	1083-56-3	0.788
Benzene, 1,1'-(3-methyl-1-propene-1,3-diyl)bis-	34.386	7614-93-9	0.840
Benzene, 1,1'-(2-methyl-1-propenylidene)bis-	34.898	781-33-9	1.217
1-(4-Methylphenyl)-4-phenylbuta-1,3-diene	36.410	37985-11-8	0.663
1,1':3',1''-Terphenyl, 5'-phenyl-	68.132	612-71-5	1.057
Polycyclic aromatic hydrocarbons (PAH)	Σ(%area)		11.226
Naphthalene	19.491	91-20-3	1.199
Naphthalene, 1-methyl-	22.770	90-12-0	0.581
Naphthalene, 2-methyl-	23.259	91-57-6	0.959
Naphthalene, 1,4-dimethyl-	26.202	571-58-4	0.719
Naphthalene, 1,2,3,4-tetrahydro-1-phenyl-	34.473	3018-20-0	0.732
Naphthalene, 1-phenyl-	36.578	605-02-7	2.801
Naphthalene, 2-phenyl-	40.017	612-94-2	2.281
Naphthalene, 2-(phenylmethyl)-	44.292	613-59-2	1.954
Nitrogenated Compounds	Σ(%area)		21.372
Benzyl nitrile	17.566	140-29-4	0.265
Benzeneacetonitrile, α-methyl-	18.434	1823-91-2	0.738
1,2-Benzenedicarbonitrile	21.233	91-15-6	0.415
Benzenebutanenitrile	23.461	2046-18-6	14.489
quinoline, 1,2-dihydro-1-methyl-2-methylene-	24.133		0.503
3-Benzyl-4,5-dihydro-3H-pyrrole	24.347	-	1.457
1,2,3,3a-Tetrahydropentalene, 1,1-dimethyl-3-cyanomethylene-	24.851	-	0.490
Naphthalene, 1-isocyano-	28.187	09/04/1984	1.047

Naphthalene, 1-isocyano-	28.899	09/04/1984	0.606
1-Naphthaleneacetonitrile	32.306	132-75-2	0.847
Naphthalene-1,3,3-tricarbonitrile, 3,4,4a,5,6,7-hexahydro-2-amino-4-(4-methylphenyl)-	49.680	163978-39-0	0.515
Oxygenated Compounds	Σ(%.area)		10.629
Phenol	12.146	108-95-2	4.159
Phenol, 2-methyl-	14.630	95-48-7	0.560
Phenol, 2,5-dimethyl-	16.580	95-87-4	0.339
p-Cumenol	20.028	99-89-8	4.178
Phenol, 2-(1-phenylethyl)-	33.240	4237-44-9	0.269
Benzaldehyde, 2-methyl-, (2,4-dinitrophenyl)hydrazone	50.779	1773-44-0	1.124
Non identified fraction	Σ(%.area)		2.574