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APPENDICES

APPENDIX A Temperature Profiles

Table A1 Pyrolysis conditions: Non-catalytic Pyrolysis

Tire = 30 g, N_2 flow = 30 ml/min

Pyrolysis Temperature (T2) = 500 °C

Catalytic Temperature (T1) = 350 °C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	33.4	31.1	32	367.9	499.2	62	361.2	506.7	92	361.2	496.6
4	53.6	52.8	34	370.2	496.9	64	356.4	502.8	94	359.9	507.8
6	78.4	81.5	36	367.4	499.9	66	352.4	491.8	96	354.5	502.6
8	120.4	125.2	38	366.4	496.5	68	353.4	502.7	98	350.1	500.9
10	145.7	158.0	40	364.2	498.3	70	346.2	500.1	100	353.5	502.7
12	186.0	205.0	42	365.5	495.2	72	355.2	502.3	102	350.5	494.0
14	266.2	302.6	44	357.2	502.7	74	351.4	496.2	104	351.2	502.2
16	277.5	325.5	46	359.1	502.3	76	355.8	508.7	106	353.1	498.8
18	296.5	412.3	48	353.9	506.1	78	352.4	504.2	108	352.4	505.7
20	324.4	429.8	50	352.7	500.1	80	352.0	505.7	110	350.2	495.8
22	331.9	470.8	52	355.6	502.9	82	352.9	497.9	112	349.2	494.8
24	349.1	500.2	54	358.8	497.0	84	351.4	501.5	114	356.1	499.8
26	360.1	501.5	56	359.1	500.9	86	350.3	508.0	116	351.3	499.0
28	363.2	486.0	58	355.9	502.8	88	342.5	496.4	118	350.2	499.2
30	368.4	501.2	60	351.9	501.1	90	361.1	506.3	120	349.4	498.9

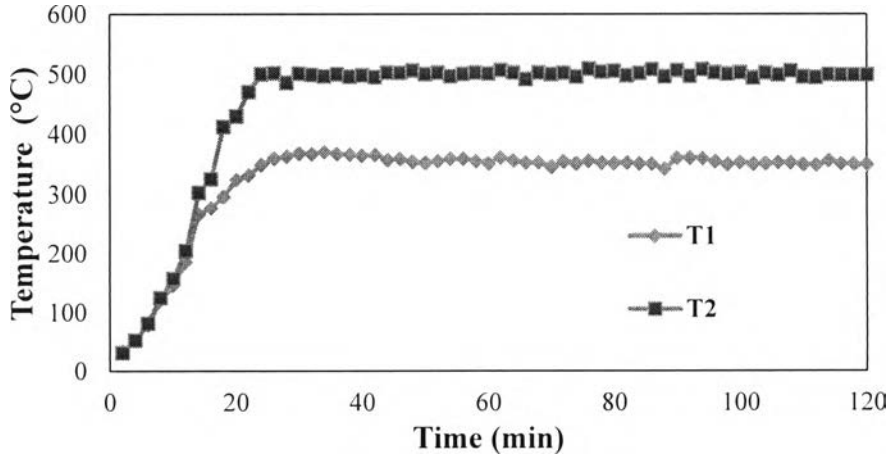

Figure A1 Temperature profiles of non-catalytic pyrolysis.

Table A2 Pyrolysis conditions: KL catalyst

Tire = 30 g, KL = 7.5g, N_2 flow = 30 ml/min

Pyrolysis Temperature (T2) = 500 °C

Catalytic Temperature (T1) = 350 °C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	30.2	33.1	32	358.0	504.6	62	354.7	506.3	92	352.3	507.8
4	49.4	55.8	34	354.9	497.4	64	357.8	499.1	94	350.0	496.8
6	58.1	67.7	36	363.1	496.2	66	356.6	506.9	96	352.9	506.5
8	88.3	110.9	38	360.9	506.4	68	354.2	496.4	98	356.9	506.0
10	115.2	148.0	40	357.1	500.4	70	350.4	497.1	100	353.9	498.7
12	154.1	199.5	42	355.6	506.0	72	348.6	506.9	102	352.4	503.1
14	194.4	252.9	44	354.6	496.6	74	355.1	499.2	104	347.1	499.7
16	249.1	342.2	46	353.0	507.1	76	356.1	502.1	106	352.6	504.4
18	289.9	411.8	48	351.3	497.3	78	354.5	494.5	108	356.0	500.0
20	322.8	454.9	50	348.5	502.8	80	351.6	507.2	110	353.4	503.2
22	324.6	513.3	52	354.4	495.5	82	349.0	499.5	112	348.9	493.6
24	334.4	503.8	54	353.8	495.9	84	346.9	508.4	114	355.1	507.1
26	336.9	493.5	56	352.4	503.2	86	357.5	498.5	116	354.1	500.1
28	344.1	507.5	58	350.0	500.3	88	357.2	505.6	118	351.6	505.7
30	361.5	499.5	60	347.8	497.7	90	355.4	497.7	120	347.2	498.2

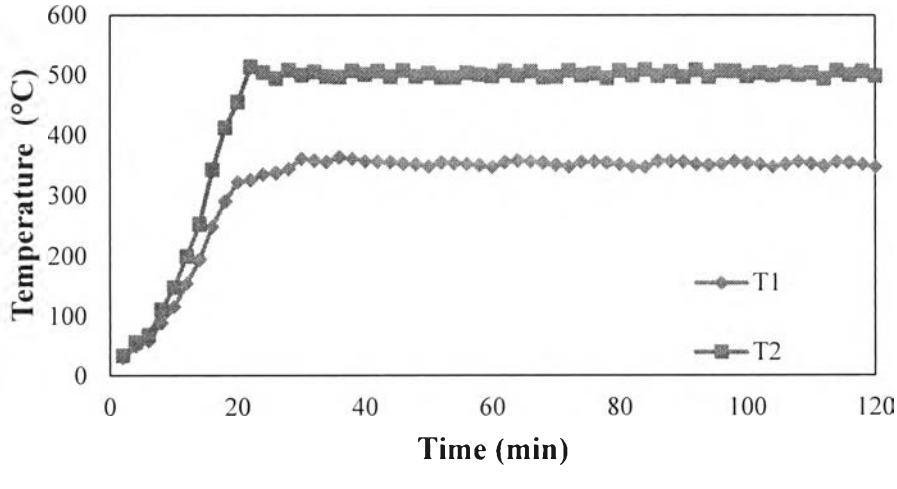

Figure A2 Temperature profiles of KL pyrolysis.

Table A3 Pyrolysis conditions: 1% Rh/KL catalyst

Tire = 30 g, N_2 flow = 30 ml/min

Pyrolysis Temperature (T2) = 500 °C

Catalytic Temperature (T1) = 350 °C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	28.5	30.3	32	366.4	496.9	62	356.3	503.4	92	357.6	498.7
4	59.1	82.4	34	365.8	500.6	64	355.0	494.4	94	356.3	505.7
6	83.8	125.8	36	366.4	499.8	66	353.1	505.3	96	355.0	500.4
8	114.8	176.3	38	365.0	498.9	68	352.5	500.5	98	353.2	501.5
10	153.8	253.6	40	364.5	501.2	70	350.8	498.8	100	351.1	493.3
12	194.8	298.2	42	362.6	503.4	72	348.9	493.6	102	349.3	508.2
14	247.1	375.3	44	361.2	499.8	74	354.7	506.1	104	355.1	496.3
16	305.8	426.2	46	359.5	505.6	76	356.5	498.1	106	357.3	501.7
18	320.8	468.3	48	358.1	494.9	78	356.5	503.1	108	356.7	495.1
20	340.3	507.5	50	356.5	506.2	80	354.4	494.1	110	355.1	507.7
22	350.5	497.5	52	354.6	496.8	82	352.4	506.5	112	353.3	497.1
24	358.4	503.8	54	352.9	502.9	84	351.3	499.5	114	351.1	500.5
26	364.7	505.1	56	350.9	493.5	86	349.1	499.7	116	349.1	493.9
28	366.2	499.5	58	348.9	508.1	88	353.9	503.4	118	347.1	502.5
30	367.1	507.1	60	354.9	498.9	90	358.2	502.4	120	355.7	504.3

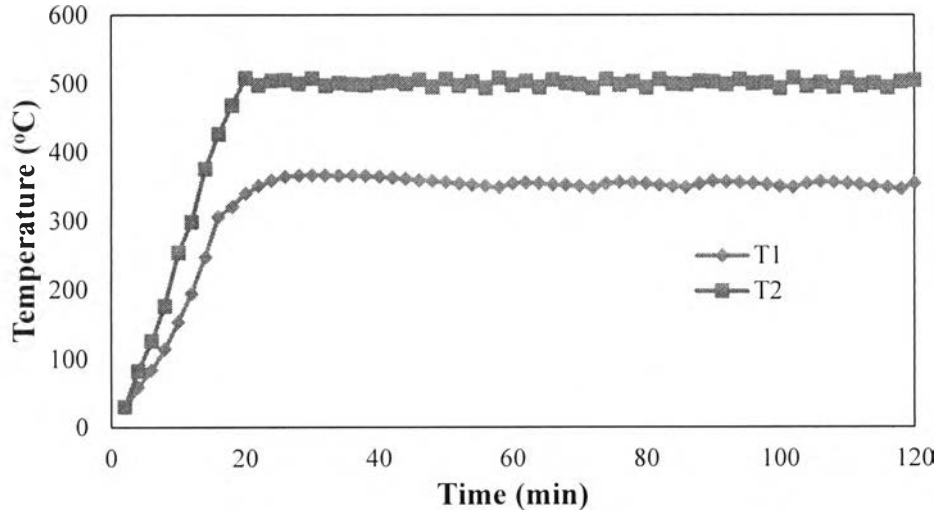

Figure A3 Temperature profiles of 1% Rh/KL pyrolysis.

APPENDIX B Yields of Pyrolysis Products

Table B1 Yield of products obtained from using KL and 1% Rh/KL catalysts

Sample	%Metal loading	Yield (%)		
		Gas	Liquid	Solid
Non-catalyst	-	10.19	45.81	44.00
KL	0	13.24	42.98	43.78
Rh/KL	1	17.10	41.57	41.33

APPENDIX C Gas Yield (%)

Table C1 Yield of gases obtained from pyrolysis with 1%Rh/KL

Sample Component	Non-Catalyst	KL	1%Rh/KL
Methane	21.122	19.058	18.891
Ethylene	9.744	9.156	9.201
Ethane	16.516	15.529	15.832
Propylene	12.685	12.060	12.403
Propane	9.399	8.893	9.125
C4	19.627	19.377	19.895
C5	10.903	15.923	14.650
C6	0	0	0
C7	0	0	0
C8	0	0	0
Total	100	100	100

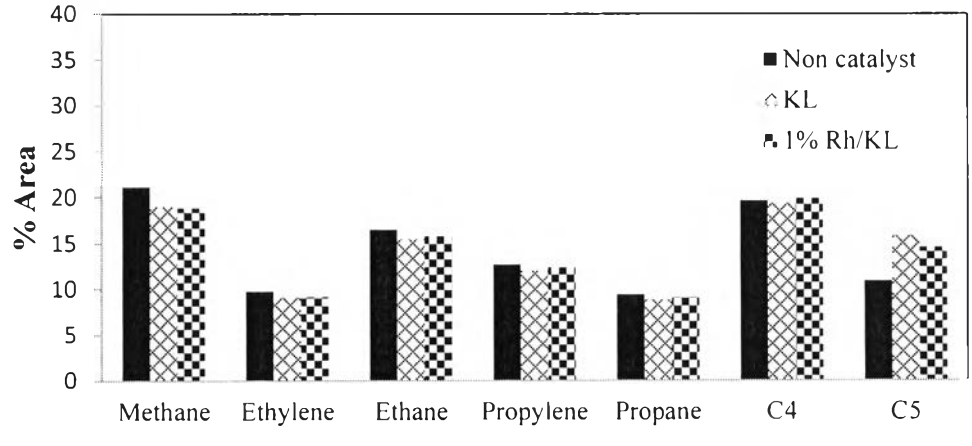

Figure C1 Distribution of gases obtained from pyrolysis with 1%Rh/KL catalyst.

APPENDIX D Hydrocarbon species in Maltenes

Table D1 Hydrocarbon species in maltene from using the non-catalyst batch

Group	Class	Name	%Area
SATs		Tridecane	0.2234
		3-Tridecene, (E)-	0.8763
		Tetradecane	0.6476
		1-Dodecen-3-yne	0.6411
		1-Dodecene	1.1833
		Tetradecane	0.7016
		3-Tetradecen-5-yne, (Z)-	0.7764
		Hexadecane	1.7856
		Hexadecane	0.3343
		Hexadecane	0.7313
OLEs		1-Dodecene	1.1833
		3-Tridecene, (E)-	0.8763
		3-Tetradecen-5-yne, (Z)-	0.7764
		1-Dodecen-3-yne	0.6411
		1,5-Cyclooctadiene, 3-(1-methyl-2-propenyl)-	0.5943
		2-Dodecen-4-yne, (Z)-	0.5333
		1-Dodecene	0.5088
MAHs	Indanes	1H-Indene, 2,3-dihydro-1,6-dimethyl-	1.1668
		1H-Indene, 2,3-dihydro-1,6-dimethyl-	1.0663
		1H-Indene, 3-ethenyl-2,3-dihydro-1,1-dimethyl-	0.8600
		Indan, 1-methyl-	0.8237
		1H-Indene, 2,3-dihydro-1,6-dimethyl-	0.8124
		1H-Indene, 2,3-dihydro-4-propyl-	0.6059
		1H-Indene, 2,3-dihydro-1,1,5-trimethyl-	0.5506
		Indan, 1-methyl-	0.5415
		1H-Indene, 2,3-dihydro-4-methyl-	0.4816
		1H-Indene, 2,3-dihydro-4-propyl-	0.4578
		Indane	0.3930
		1H-Indene, 2,3-dihydro-4,7-dimethyl-	0.3836
		1H-Indene, 2,3-dihydro-4-propyl-	0.3478
		1H-Indene, 3-ethenyl-2,3-dihydro-1,1-dimethyl-	0.2934
		1H-Indene, 2,3-dihydro-4,7-dimethyl-	0.2830
		1H-Indene, 2,3-dihydro-1,1,5-trimethyl-	0.2269
		1H-Indene, 3-ethenyl-2,3-dihydro-1,1-dimethyl-	0.2040
		1H-Indene, 2,3-dihydro-1,1,5-trimethyl-	0.1781
		1H-Indene, 3-ethenyl-2,3-dihydro-1,1-dimethyl-	0.1640
		1H-Indene, 3-ethenyl-2,3-dihydro-1,1-dimethyl-	0.1606
	Alkylbenzenes	Benzene, 3-cyclohexen-1-yl-	0.8825
		Benzene, cyclopentyl-	0.7508
		Benzene, hexyl-	0.7192
		Benzene, cyclopentyl-	0.6010
		Benzene, cyclohexyl-	0.4476
		Benzene, heptyl-	0.4374

Group	Class	Name	%Area
MAHs	Alkylbenzenes	Benzene, 1-methyl-2-(1-methylethyl)-	0.3731
		Benzene, (1,3-dimethylbutyl)-	0.3308
		Benzene, pentyl-	0.2969
		Benzene, (1,3-dimethylbutyl)-	0.2794
		Benzene, cyclohexyl-	0.2469
		Cyclohexene, 1-phenyl-	0.2220
		Benzene, 1,4-diethyl-	0.2156
		Benzene, (1,1-diethylpropyl)-	0.2054
		1-Phenyl-5-methylheptane	0.2037
		Benzene, (3-cyclopentylpropyl)-	0.1933
		Benzene, cyclohexyl-	0.1509
		Benzene, (1-methylbutyl)-	0.1488
	Tetralins	Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	0.4726
		Naphthalene, 5-ethyl-1,2,3,4-tetrahydro-	0.3645
		Naphthalene, 1,2-dihydro-3-methyl-	0.2983
		Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	0.2977
		Naphthalene, 1,2,3,4-tetrahydro-5-methyl-	0.2748
		Naphthalene, 1,2,3,4-tetrahydro-5-methyl-	0.2616
		Naphthalene, 1,2,3,4-tetrahydro-6-propyl-	0.2298
		Naphthalene, 1,2,3,4-tetrahydro-1-methyl-	0.1664
	Alkenylbenzenes	Benzene, (1-ethyl-1-propenyl)-	1.5108
		Benzene, (2-cyclopropylethenyl)-	1.1233
		Hexa-2,4-dienylbenzene	0.9598
		Benzene, (1-methyl-2-cyclopropen-1-yl)-	0.5550
		Benzene, 1-(1-buten-3-yl)-2-vinyl-	0.5513
		Benzene, 4-hexenyl-	0.5068
		Benzene, 1-heptenyl-	0.3053
		3-Ethyl-3-phenyl-1-pentene	0.2693
		Benzene, 4-hexenyl-	0.2669
		Benzene, 1,2-bis(1-buten-3-yl)-	0.2498
		Benzene, (1,2,3-trimethyl-2-cyclopropen-1-yl)-	0.2478
		Benzene, (1,1-dimethyl-2-butynyl)-	0.2319
		Benzene, 2-(1,3-butadienyl)-1,3,5-trimethyl-	0.2223
		Benzene, 1-(1-buten-3-yl)-2-vinyl-	0.2026
		Benzene, 1-(1-buten-3-yl)-2-vinyl-	0.1691
		3-Ethyl-3-phenyl-1-pentene	0.1633
		Benzene, [(1-methylethylidene)cyclopropyl]-, (R)-	0.1618
		Hex-1-enylbenzene	0.1533
		Benzene, (2-cyclopropylethenyl)-	0.1530
	Indenes	1H-Indene, 2,3-dimethyl-	1.9680
		(1-Methylenepent-2-enyl)benzene	0.9372
		1H-Indene, 2,3-dimethyl-	0.9320
		(1-Methylpenta-2,4-dienyl)benzene	0.9027
		1,2,3,6,7,8-Hexahydro-as-indacene	0.7143
		1H-Indene, 2,3-dimethyl-	0.6121
		(1-Methylpenta-2,4-dienyl)benzene	0.5530
		1,2,3-Trimethylindene	0.5470
		(1-Methylpenta-2,4-dienyl)benzene	0.5452
		1H-Indene, 1-methyl-3-propyl-	0.5005

Group	Class	Name	%Area
MAHs	Indenes	1,2,3-Trimethylindene	0.4750
		1,2,3-Trimethylindene	0.4153
		1H-Indene, 1-methyl-3-propyl-	0.4127
		1H-Indene, 1-ethenyl-2,3-dihydro-	0.3883
		1,2,3-Trimethylindene	0.3836
		1H-Indene, 3-ethyl-1-(1-methylethyl)-	0.3465
		1,2,3-Trimethylindene	0.3426
		1H-Indene, 2,3-dimethyl-	0.3360
		1,2,3-Trimethylindene	0.3032
		1H-Indene, 2,3-dimethyl-	0.2719
		1H-Indene,2,3-dihydro-2,2-dimethyl-	0.2386
		1H-Indene, 3-ethyl-1-(1-methylethyl)-	0.2332
		1H-Indene, 5,5'-(1,10-decanediyl)bis[octahydro-	0.2078
		1H-Indene, 3-ethyl-1-(1-methylethyl)-	0.2004
		1H-Indene, 3-ethyl-1-(1-methylethyl)-	0.2001
		1H-Indene, 1-methyl-3-propyl-	0.1923
		1H-Indene, 2,3-dimethyl-	0.1601
			0.0000
DAHs		Naphthalene, 1-methyl-	3.7545
		Naphthalene, 1-methyl-	3.0762
		h-Naphthalene, 1,8-dimethyl-	2.1437
		Naphthalene, 1-ethyl-	1.7838
		h-Naphthalene, 1,8-dimethyl-	1.7601
		h-Naphthalene, 1,8-dimethyl-	1.1602
		h-Naphthalene, 1,4,6-trimethyl-	1.0148
		Naphthalene, 1,3-dimethyl-	0.9774
		Naphthalene, 2-(1-methylethyl)-	0.9140
		h-Naphthalene, 1,4,6-trimethyl-	0.7005
		Naphthalene, 2-ethyl-	0.5093
		h-Naphthalene, 1,6,7-trimethyl-	0.4834
		h-Naphthalene, 1,4,5-trimethyl-	0.3858
		Naphthalene, 1-ethyl-	0.3748
		Naphthalene, 2-(1-methylethyl)-	0.2593
		Naphthalene, 1-propyl-	0.2471
		Naphthalene, 1-(2-propenyl)-	0.2316
		h-Naphthalene, 1,4,5-trimethyl-	0.2089
		h-Naphthalene, 1,2,4a,5,6,8a-hexahydro-4,7-dimethyl-1-(1-methylethyl)-	0.1689
		A-Naphthalene, 1,2-dihydro-	0.3929
		A-Naphthalene, 1,2-dihydro-	0.1646
		A-Naphthalene	1.7932
		1-Isopropenylnaphthalene	0.1717
PAHs		Biphenyl	1.6582
		B-1,1'-Biphenyl, 4-methyl-	0.9182
		B-1,1'-Biphenyl, 4-methyl-	0.8579
		E-Benzene, 1,1'-(1,3-propanediyl)bis-	0.5603
		E-Benzene, (1,2-dicyclopropyl-2-phenylethyl)-	0.5437
		z-Acenaphthene	0.5184
		B-1,1'-Biphenyl, 4-methyl-	0.5081
		B-2,2'-Dimethylbiphenyl	0.4371

Group	Class	Name	%Area
PAHs		z-9H-Fluorene, 2-methyl-	0.3671
		z-Fluorene	0.2335
		B-4-Ethylbiphenyl	0.2010
		z-Phenanthrene	0.1714
		B-1,1'-Biphenyl, 3,4'-dimethyl-	0.1570
PPAHs		Benzo[b]thiophene, 2,7-dimethyl-	0.1476
		Benzo[b]thiophene, 2-ethyl-7-methyl-	0.0786
		Benzo[b]thiophene, 4-methyl-	0.0668
		b-3-Methylbenzothiophene	0.0648
		Benzo[b]thiophene, 2,5-dimethyl-	0.0530
		Benzo[b]thiophene	0.0367
		Benzo[b]thiophene, 2-methyl-	0.0242
		y-Thiophene, 2-phenyl-	0.0215
		D-1,7-Dimethyldibenzothiophene	0.0187
		z-4-Methylnaphtho[1,2-b]thiophene	0.0187
		Dibenzothiophene	0.0186
		z-4-Methylnaphtho[1,2-b]thiophene	0.0163
		Thiophene, 2-(1-methylethyl)-	0.0152
		z-Naphtho[2,1-b]thiophene	0.0080
		D-2,8-Dimethyldibenzo(b,d)thiophene	0.0080
		z-Phenaleno[1,9-bc]thiophene	0.0080
		D-Thioxanthene	0.0057
		y-Thiophene, 3-phenyl-	0.0052
		Benzo[b]naphtho[2,1-d]thiophene	0.0045
		Benzo[b]thiophene, 2-methyl-	0.0019
		Benzo[b]thiophene, 7-ethyl-	0.0012
TERs		Limonene	16.1588
		Bi-2,4,6-cycloheptatrien-1-yl	1.2898
		Cyclohexene, 1-methyl-4-(1-methylethenyl)-, (S)-	0.2368
		Bicyclo[3.2.1]oct-2-ene, 3-methyl-4-methylene-	0.1584
		3-Carene	0.1082
		Dispiro[4.2.4.2]tetradeca-6,13-diene	4.8490

Table D2 Hydrocarbon species in maltene from using KL batch

Group	Class	Name	%Area
SATs		Tridecane	0.8166
		Hexadecane	0.4426
		Hexadecane	0.2509
		Hexadecane	1.5143
		Hexadecane	0.5149
		Heptacosane	0.7392
OLEs		3-Tridecene, (E)-	0.6011
		3-Tetradecene, (Z)-	1.6277
		1-Octene, 3,7-dimethyl-	0.6117
MAHs	Indanes	Indan, 1-methyl-	6.6773
		Indane	3.2006
		1H-Indene, 2,3-dihydro-1,3-dimethyl-	1.0603
		1H-Indene, 2,3-dihydro-1,6-dimethyl-	0.9654
		1H-Indene, 2,3-dihydro-1,1-dimethyl-	0.9421
		Indan, 1-methyl-	0.6267
		1H-Indene, 2,3-dihydro-1,1-dimethyl-	0.3404
		1H-Indene, 2,3-dihydro-1,6-dimethyl-	0.3203
	Alkylbenzenes	Benzene, cyclohexyl-	2.6988
		Benzene, (1,3-dimethylbutyl)-	2.1738
		Benzene, (1-methylethyl)-	1.9362
		Benzene, cyclopentyl-	1.7966
		Benzene, pentyl-	1.2433
		Benzene, heptyl-	0.8220
		Benzene, cyclohexyl-	0.7768
		Benzene, hexyl-	0.5863
		Benzene, 1-methyl-4-(1-methylpropyl)-	0.4571
		Benzene, 1-methyl-2-(1-methylethyl)-	0.3931
		Benzene, octyl-	0.2653
		Benzene	0.1458
	Tetralins	Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	9.5421
		Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	3.5944
		Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	0.2743
		Naphthalene, 5-ethyl-1,2,3,4-tetrahydro-	1.7201
		Naphthalene, 1-ethyl-1,2,3,4-tetrahydro-	0.4863
		Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	0.3462
		Naphthalene, 5-ethyl-1,2,3,4-tetrahydro-	0.5287
		Naphthalene, 1,2,3,4-tetrahydro-5-methyl-	1.0950
		Naphthalene, 1,2,3,4-tetrahydro-1,4-dimethyl-	0.2489
		Naphthalene, 1,2,3,4-tetrahydro-	0.9951
		Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	0.3462
		Naphthalene, 5-ethyl-1,2,3,4-tetrahydro-	0.5287
	Alkenylbenzenes	Benzene, 3-hexenyl-	0.6911
		Benzene, 3-cyclohexen-1-yl-	1.7074
		Benzene, (1-ethyl-1-propenyl)-	0.8004
	Indenes	2-Methylindene	1.0739

Group	Class	Name	%Area
MAHs	Indenes	2-Methylindene	0.4566
		1H-Indene, 3-ethyl-1-(1-methylethyl)-	0.2426
		1H-Indene, 2,3-dimethyl-	0.9084
		1H-Indene, 1,3-dimethyl-	1.2139
		1H-Indene, 1-ethylidene-	3.1652
		1,2,3,6,7,8-Hexahydro-as-indacene	0.7226
		1,2,3-Trimethylindene	0.5399
		1,2,3-Trimethylindene	0.6284
		1,2,3-Trimethylindene	0.7309
DAHs		Naphthalene, 1,2-dihydro-2-methyl-	1.5212
		Naphthalene, 1-(2-propenyl)-	1.5212
		H-Naphthalene, 2,3,6-trimethyl-	1.2468
		Naphthalene, 1-methyl-	1.2421
		Naphthalene, 1-ethyl-	1.1037
		H-Naphthalene, 1,6-dimethyl-	0.8722
		Naphthalene, 1-propyl-	0.7585
		H-Naphthalene, 1,7-dimethyl-	0.6977
		Naphthalene, 1-ethyl-	0.6848
		H-Naphthalene, 1,6,7-trimethyl-	0.6032
		Naphthalene, 2-ethyl-	0.5869
		H-Naphthalene, 1,4,5-trimethyl-	0.5219
		Naphthalene, 2-(1-methylethyl)-	0.5162
		Naphthalene, 1-(2-propenyl)-	0.4863
		H-Naphthalene, 1,4,5-trimethyl-	0.4125
		Naphthalene, 2-methyl-1-propyl-	0.4035
		Naphthalene, 1-methyl-	0.3670
		H-Naphthalene, 1,6,7-trimethyl-	0.2638
		1-Isopropenylnaphthalene	0.2394
		Naphthalene, 2-(1-methylethyl)-	0.2149
		P-Azulene	0.1696
PAHs		Benzene, 1,1'-(1,3-propanediyl)bis-	2.3762
		B-4-Ethylbiphenyl	1.5341
		B-2,2'-Dimethylbiphenyl	1.2323
		z-Phenanthrene	0.7948
		z-9H-Fluorene, 9-methyl-	0.7200
		B-1,1'-Biphenyl, 3-methyl-	0.6011
		Benzene, 1,1',1'',1'''-(1,6-hexanediylidene)tetrakis-	0.5987
		B-1,1'-Biphenyl, 4-methyl-	0.5262
		z-1H-Phenalene	0.4493
		Biphenyl	0.3883
		z-9H-Fluorene, 2-methyl-	0.2496
		z-Acenaphthene	0.1434
PPAHs		Benzo[b]thiophene, 2,5-dimethyl-	0.1142
		Benzo[b]thiophene, 2-methyl-	0.0691
		Benzo[b]thiophene	0.0530
		Benzo[b]thiophene, 6-methyl-	0.0398
		Benzo[b]thiophene, 2,7-dimethyl-	0.0385
		b3-Methylbenzothiophene	0.0294
		Thiophene, 2,5-diethyl-	0.0261

Group	Class	Name	%Area
PPAHs		Benzo[b]thiophene, 2-ethyl-7-methyl-	0.0250
		Benzo[b]thiophene, 7-ethyl-	0.0201
		Thiophene, 2-(1-methylethyl)-	0.0175
		Benzo[b]thiophene, 3,5-dimethyl-	0.0123
		y-Thiophene, 2-phenyl-	0.0113
		Thiophene, 2-hexyl-	0.0103
		z-Naphtho[2,3-b]thiophene, 4,9-dimethyl-	0.0087
		Thiophene, 2-ethyl-	0.0087
		Thiophene, 3-(2-butenyl)-, (E)-	0.0064
		D-Thioxanthene	0.0063
		D-Thioxanthene	0.0061
		b1-Methyldibenzothiophene	0.0060
		Dibenzothiophene	0.0050
		Benzo[b]thiophene, 2-methyl-	0.0049
		T3,4-Dimethylthiophene	0.0047
		Thiophene, 2-propyl-	0.0035
		y-Thiophene, 3-phenyl-	0.0033
TERs		Bicyclo[6.1.0]nonane, 9-(1-methylethylidene)-	1.0431
		Bicyclo[3.2.1]oct-2-ene, 3-methyl-4-methylene-	0.3604
		Cyclohexene, 1-methyl-4-(1-methylethenyl)-, (S)-	0.8275
		Bicyclo[6.1.0]nonane, 9-(1-methylethylidene)-	1.1538
		Bicyclo[3.2.1]oct-2-ene, 3-methyl-4-methylene-	0.3986
		Cyclohexene, 1-methyl-4-(1-methylethenyl)-, (S)-	0.9153

Table D3 Hydrocarbon species in maltene from using Rh/KL batch

Group	Class	Name	%Area
SATs		Tridecane, 2-methyl-2-phenyl-	0.2131
		Tridecane	0.7961
		Tridecane	1.1066
		Hexadecane	0.1804
		Hexadecane	3.4135
		Hexadecane	0.8768
		Hexadecane	2.3057
		Hexadecane	0.5097
		Hexadecane	0.2542
		Heptacosane	0.1876
OLEs		3-Tetradecene, (Z)-	1.0028
		3-Tetradecene, (Z)-	0.5471
		3-Tetradecene, (Z)-	0.5074
		Cyclopropane, 1-heptyl-2-methyl-	0.7970
		3-Tridecene, (E)-	1.1305
		ç-Elemene	1.3017
MAHs	Indanes	Indane	0.4161
		Indan, 1-methyl-	0.8946
		Indan, 1-methyl-	0.5671
		Indan, 1-methyl-	1.9447
		1H-Indene, 2,3-dihydro-1,6-dimethyl-	0.3955
		1H-Indene, 2,3-dihydro-1,6-dimethyl-	1.1920
		1H-Indene, 2,3-dihydro-1,3-dimethyl-	1.3091
		1H-Indene, 2,3-dihydro-1,1-dimethyl-	1.1632
		1H-Indene, 2,3-dihydro-1,1-dimethyl-	0.4202
	Alkylbenzenes	Diphenylmethane	0.1695
		Benzene, pentyl-	0.7512
		Benzene, nonyl-	0.1558
		Benzene, hexyl-	1.1409
		Benzene, heptyl-	0.8825
		Benzene, heptyl-	0.3651
		Benzene, cyclopentyl-	0.7577
		Benzene, cyclohexyl-	0.3211
		Benzene, cyclohexyl-	0.6826
		Benzene, 1-methyl-4-(1-methylethyl)-	0.4110
		Benzene, (3-cyclopentylpropyl)-	0.4301
		Benzene, (2-cyclohexylethyl)-	0.2499
		Benzene, (1,3-dimethylbutyl)-	0.3583
		Benzene, (1-methylhexyl)-	0.4630
	Tetralins	Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	1.9305
		Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	1.1915
		Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	0.2806
		Naphthalene, 6-ethyl-1,2,3,4-tetrahydro-	0.6144
		H-Naphthalene, 1,2,3,4-tetrahydro-1,8-dimethyl-	1.0983
		H-Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-	0.8392
		Naphthalene, 1,2,3,4-tetrahydro-6-propyl-	0.5114
		Naphthalene, 1,2,3,4-tetrahydro-5-methyl-	0.6170
		Naphthalene, 1,2,3,4-tetrahydro-5-methyl-	0.3270
		Naphthalene, 1,2,3,4-tetrahydro-1,4-dimethyl-	2.1167
		Naphthalene, 1,2,3,4-tetrahydro-1,4-dimethyl-	0.1364
		Naphthalene, 1,2,3,4-tetrahydro-1,1-dimethyl-	0.3887
		Naphthalene, 1,2,3,4-tetrahydro-1-propyl-	0.5344
		Naphthalene, 1,2,3,4-tetrahydro-1-nonyl-	0.4702
		Naphthalene, 2-ethyl-1,2,3,4-tetrahydro-	0.3714
	Alkenylbenzenes	Cyclopropene, 2,3-dimethyl-3-phenyl-	0.9304
		Cyclohexene, 1-phenyl-	0.5382
		Benzene, 4-hexenyl-	0.3987
		Benzene, 3-cyclohexen-1-yl-	1.4738
		Benzene, 2-heptenyl-	0.2321
		Benzene, 1-heptenyl-	0.6502
		Benzene, 1-(1-buten-3-yl)-2-vinyl-	0.6274
		Benzene, (2-cyclopropylethenyl)-	0.9131

Group	Class	Name	%Area
MAHs	Alkenylbenzenes	Benzene, (1,1-dimethyl-2-butynyl)-	0.1438
		Benzene, (1-methylnonadecyl)-	0.3073
		Benzene, (1-ethyl-1-propenyl)-	1.9163
		3-Ethyl-3-phenyl-1-pentene	1.1019
	Indenes	2-Methylindene	1.3259
		2-Methylindene	0.5637
		1H-Indene, 3-ethyl-1-(1-methylethyl)-	0.2996
		1H-Indene, 3-ethenyl-2,3-dihydro-1,1-dimethyl-	1.1506
		1H-Indene, 3-ethenyl-2,3-dihydro-1,1-dimethyl-	0.2829
		1H-Indene, 2,3-dimethyl-	1.1216
		1H-Indene, 1,3-dimethyl-	1.4987
		1H-Indene, 1-ethylidene-	3.9080
		1,2,3,6,7,8-Hexahydro-as-indacene	0.8922
		1,2,3-Trimethylindene	0.6666
		1,2,3-Trimethylindene	0.7759
		1,2,3-Trimethylindene	0.9024
DAHs		Naphthalene, 2,3-dimethyl-	1.3206
		Naphthalene, 2-methyl-1-propyl-	0.4376
		Naphthalene, 2-(1-methylethyl)-	0.3379
		Naphthalene, 1,4,5-trimethyl-	1.0060
		Naphthalene, 1,4-dimethyl-	0.5193
		Naphthalene, 1-propyl-	0.2810
		Naphthalene, 1-methyl-	4.6290
		Naphthalene, 1-ethyl-	2.3102
		Naphthalene, 1-ethyl-	4.3278
		Naphthalene, 1-ethyl-	1.7529
		H-Naphthalene, 1,6,7-trimethyl-	0.7029
		H-Naphthalene, 1,4,6-trimethyl-	1.6983
		H-Naphthalene, 1,4,5-trimethyl-	0.4819
		H-Naphthalene, 1,4,5-trimethyl-	0.7832
		H-Naphthalene, 1,4,5-trimethyl-	1.2475
		Azulene	1.9984
PAHs		B-1,1'-Biphenyl, 2-ethyl-	0.3689
		B-1,1'-Biphenyl, 4-methyl-	1.4101
		B-2,2'-Dimethylbiphenyl	0.8936
		B-2,2'-Dimethylbiphenyl	0.1950
		B-4-Ethylbiphenyl	0.4151
		Biphenyl	2.4345
		E-Benzene, 1,1'-ethylidenebis-	0.4887
		z-1H-Phenalene	0.4793
		z-9H-Fluorene, 1-methyl-	0.7324
		z-9H-Fluorene, 2-methyl-	0.3372
		z-9H-Fluorene, 9-methyl-	0.1635
		z-9H-Fluorene, 9-methylene-	0.5250
PPAHs		Thiophene, 3,4-diethyl-	0.0025
		Thiophene, 3-ethyl-	0.0826
		Thiophene, 3-(1,1-dimethylethyl)-	0.0975
		Thiophene, 2,5-dimethyl-	0.0295
		Thiophene, 2,5-diethyl-	0.0476
		Thiophene, 2,3,4-trimethyl-	0.0110
		Thiophene, 2-propyl-	0.0922
		Thiophene, 2-ethyl-	0.0125
		Thiophene, 2-(1-methylethyl)-	0.0358
		T-3,4-Dimethylthiophene	0.0272
		T-3,4-Dimethylthiophene	0.0455
		Dibenzothiophene	0.0063
		D-Thioxanthene	0.0594
		D-3,7-Dimethyldibenzothiophene	0.0078
		D-2,6-Dimethyldibenzothiophene	0.0045
		D-1,7-Dimethyldibenzothiophene	0.0046
		D-1-Methyldibenzothiophene	0.0042
		Benzo[b]thiophene, 7-ethyl-2-methyl-	0.0062
		Benzo[b]thiophene, 2,5-dimethyl-	0.0100
		Benzo[b]thiophene, 2,3-diethyl-	0.0190
		Benzo[b]thiophene, 2-methyl-	0.0058

Group	Class	Name	%Area
PPAHs		Benzo[b]thiophene, 2-methyl-	0.0066
		Benzo[b]thiophene, 2-ethyl-7-methyl-	0.0097
		Benzo[b]thiophene	0.0039
TERs		Bicyclo[6.1.0]nonane, 9-(1-methylethylidene)-	1.0431
		Bicyclo[3.2.1]oct-2-ene, 3-methyl-4-methylene-	0.3604
		Cyclohexene, 1-methyl-4-(1-methylethenyl)-, (S)-	0.8275
		Bicyclo[6.1.0]nonane, 9-(1-methylethylidene)-	1.1538
		Bicyclo[3.2.1]oct-2-ene, 3-methyl-4-methylene-	0.3986
		Cyclohexene, 1-methyl-4-(1-methylethenyl)-, (S)-	0.9153

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1. Publications:

1. Pithakratanayothin, S. and Jitkarnka, S. (2014) Comparison of components in oil derived from tyre pyrolysis with and without KL catalyst using GC × GC / TOF-MS. Chemical Engineering Transactions, in press.

2. Proceedings:

1. Pithakratanayothin, S. and Jitkarnka, S. (2014, March 31) analysis of a tire-derived oil using GC × GC – TOF/MS for better identification and grouping of hydrocarbon compounds. Proceeding of the 29th ICSW 2014, Philadelphia, USA.
2. Pithakratanayothin, S. and Jitkarnka, S. (2014, April 24) analysis of a tire-derived oil using GC × GC – TOF/MS for better identification and grouping of sulphur compounds. Proceeding of the 5th Research Symposium on Petrochemical and Materials Technology and the 20th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.
3. Pithakratanayothin, S. and Jitkarnka, S. (2014, August 23) comparison of components in oil derived from tyre pyrolysis with and without KL catalyst using GC × GC / TOF-MS. Proceeding of the 17th Conference Process Integration, Modelling and Optimisation for Energy Saving and Pollution Reduction, Prague, Czech Republic.