REFERENCES

Akhmedov, V.M., Al-Khowaiter, S.H., (2000) Hydroconversion of C_5–C_8 alkanes over Zr-containing supported catalysts prepared by metal vapor method. Applied Catalysis A: General, 197, 201-212.

Albertazzi, S., Ganzerla, R., Gobbi, C., Lenarda, M., Mandreoli, M., Salatelli, E., Savini, P., Storaro, L.A., (2003) Vaccari, Hydrogenation of naphthalene on noble-metal-containing mesoporous MCM-41 aluminosilicates. Journal of Molecular Catalysis A: Chemical, 200, 261-270.

Ali, M.A., Kimura, T., Suzuki, Y., Al-Saleh, M.A., Hamid, H., Inui, T. (2002) Hydrogen spillover phenomenon in noble metal modified clay-based hydrocracking catalysts. Applied Catalysis A: General, 27, 63-72.

Barbier, J., Lamy-Pitara, E., Maracot, P., Boitiaux, J.P., Cosyns, J., Verna, F. (1990) Role of Sulfur in Catalytic Hydrogenation Reactions. Advanced in Catalysis, 37, 279-

Barbooti, M.M., Mohamed, T.J., Hussain, A.A., Abas, F.O. (2004) Optimization of pyrolysis conditions of scrap tires under inert gas atmosphere. Journal of Analytical and Applied Pyrolysis, 72, 165-170.

Benallal, B., Roy, C., Pakdel, C., Chabot, S., Poirier, M.A.(1995) Characterization of pyrolytic light naphtha from vacuum pyrolysis of used tyres comparison with petroleum naphtha. Fuel 74, 1589-1594.

Berrueco, C., Esperanza, E., Mastal, F.J., Ceamanos, J., Garcia-Baicaicoa, P. (2005) Pyrolysis of waste tyres in an atmospheric static-bed batch reactor: Analysis of the gases obtained. Journal of Analytical and Applied Pyrolysis, 74, 245-253.

Blow, C.M. and Hepburn. M. (1982) Rubber technology and manufacture, 2nd Edition, Butterworths, Norwich.

Boxiong, S., Chengfei, W., Cai, L., Binbin, G., Rui, W. (2007) Pyrolysis of waste tyres: The influence of USY catalyst/tyre ratio on products. Journal of Analytical and Applied Pyrolysis, 78, 243-249.

Boxiong, S., Chunfei, W., Binbin, G., Rui, W., Cai, L. (2007) Pyrolysis of waste

tyres with zeolite USY and ZSM-5 catalysts. Applied Catalysis B: Environmental, 73, 150-157.

Can, F., Travert, A., Ruaux, V., Gilson, J.-P., Maugéa, F., Hub, R., Wormsbecher, R.F. (2007) FCC gasoline sulfur reduction additives: Mechanism and active sites. Journal of Catalysis, 249, 79–92.

Chen, F. and Qian, J. (2000) Studies on the thermal degradation of polybutadiene. Fuel Processing Technology, 67, 53-60.

Chen, F. and Qian, J. (2002) Studies on the thermal degradation of *cis*-1,4-polyisoprene. Fuel, 81, 2071–2077.

Choi. S. (2000) Characterization of bound rubber of filled styrene-butadiene rubber compounds using pyrolysis-gas chromatography. Journal of Analytical and Applied Pyrolysis, 55, 161–170.

Chupin, J., Gnep, J.N., Lacombe, S., and Guisnet, M. (2001) Influence of the metal and of the support on the activity and stability of bifunctional catalysts for toluene hydrogenation. Applied Catalysis A: General, 206, 43-56.

Crisafulli, C., Scire, S., Minico, S., and Solarino, L. (2002) Ni–Ru bimetallic catalysts for the CO_2 reforming of methane. Applied Catalysis A: General, 225, 1-9.

Cunliffe and Williams, P.T. (1998) Composition of oils derived from the batch pyrolysis of tyres. Journal of Analytical and Applied Pyrolysis, 44, 131-152

Diez, C., Martinez, O., Calvo, L.F., Cara, J., and Moran, A. (2004) Pyrolysis of tyres. Influence of the final temperature of the process on emissions and the calorific value of the products recovered. Waste Management, 24, 463-469.

Eliche-Quesada, D., Macias-Ortiz, M.I., Jimenez-Jimenez, J., Rodriguez-Castellon, E., and Jimenez-Lopez, J. (2006) Catalysts based on Ru/mesoporous phosphate heterostructures (PPH) for hydrotreating of aromatic hydrocarbons. Journal of Molecular Catalysis A: Chemical, 225, 41-48.

Eliche-Quesada, D., Meria-Robles, J.M., Rodriguez-Castellon, E., and Jimenez-Lopez. A. (2006) Influence of the incorporation of palladium on Ru/MCM hydrotreating catalysts. Applied Catalysis B: Environmental, 65, 118-126;

Eliche-Quesada, D., Merida-Robles, J.M., Rodríguez-Castellon, E., and Jiménez-Lopez, A. (2005) Ru, Os and Ru–Os supported on mesoporous silica doped

with zirconium as mild thio-tolerant catalysts in the hydrogenation and hydrogenolysis/hydrocracking of tetralin. Applied Catalysis A: General, 279, 209-221.

Eliche-Quesada, D., Rodríguez-Castellon, E., and Jiménez-Lopez, A. (2007) Hydrodesulfurization activity over supported sulfided ruthenium catalysts: Influence of the support. Microporous and Mesoporous Material, 99, 268-278.

Escobar, A.S., Pereira, M.M., and Cerqueira, H.S. (2008) Effect of iron and calcium over USY coke formation. Applied Catalysis A: General, 339, 61-67.

Galvagno, S., Casu, S., Casablanca, T., Calabrese, A., and Cornacchia, G. (2002) Pyrolysis process for the treatment of scrap tyres: preliminary experimental results. Waste Management, 22, 917-923.

Gao, S. and Schmidt, L.D. (1989) Effect of oxidation-reduction cycling on C_2H_6 hydrogenolysis: Comparison of Ru, Rh, Ir, Ni, Pt, and Pd on SiO_2. Journal of Catalysis, 115, 356-364.

Harris, S. and Chianelli, R.R. (1984) Catalysis by transition metal sulfides: The relation between calculated electronic trends and HDS activity. Journal of Catalysis, 86, 400 - 412.

Ishihara, A., Dumeignil, F., Lee, J., Mitsuhashi, K., Qian, E.W., and Kabe, T. (2005) Hydrodesulfurization of sulfur-containing polyaromatic compounds in light gas oil using noble metal catalysts. Applied Catalysis A: General, 289, 163-173.

Jacquin, M., Jones, D.J., Roziere, J., Albertazzi, S., Vaccari, A., Lenarda, M., Storaro, L., and Ganzerla, R. (2003) Novel supported Rh, Pt, Ir and Ru mesoporous aluminosilicates as catalysts for the hydrogenation of naphthalene. Applied Catalysis A: General, 251, 131-141.

Jitkarnka, S., Chusaksri, B., Supaphol, B., and Magaraphan, R. (2007) Influences of thermal aging on properties and pyrolysis products of tire tread compound. Journal of Analytical and Applied Pyrolysis, 80, 269-276.

Kinger, G., and Vinek, H. (2001) *n*-Nonane hydroconversion on Ni and Pt containing HMFI, HMOR and HBEA. Applied Catalysis A: General, 218, 139-149.

Lacroix, M., Boutarfa, N., Guillard, N., Vrinat, M., and Breysse, M. (1989) Hydrogenating properties of unsupported transition metal sulphides. Journal of Catalysis, 120, 473-477.

Laresgoiti, M.F., Caballero, B.M., Marco, I., Torres, A., and Cabrero, M.J. (2004) Chomón. M.J, Characterization of the liquid products obtained in tyre pyrolysis. Journal of Analytical and Applied Pyrolysis 71, 917-934.

Lee, J.K., and Rhee, H.K. (1998) Sulfur tolerance of zeolite beta-supported Pd–Pt catalysts for the isomerization of *n*-hexane. Journal of Catalysis, 177, 208-216.

Leung, D.Y.C., Yin, X.L., Zhao, Z.L., Xu, B.Y., and Chen, Y. (2002) Pyrolysis of tire powder: influence of operation variables on the composition and yields of gaseous product. Fuel Processing Technology, 79, 141-155.

Lugstein, A., Jentys, A., and Vinek, H. (1999) Hydroisomerization and cracking of *n*-octane and C_8 isomers on Ni-containing zeolites. Applied Catalysis A: General, 176, 119-128.

Mark, J.E., Erman, B., and Eirich, F. (1994) Science and technology of rubber, 2nd Edition, Academic Press, San Diego.

Mastral, A.M., Murillo, R., Callen, M.S., Garcia, T., and Snape, C.E. (2000) Influence of Process Variables on Oils from Tire Pyrolysis and Hydropyrolysis in a Swept Fixed Bed Reactor. Energy& Fuels, 14, 739-744.

Murugan, S., Ramaswamy, M.C., and Nagarajan, G. (2009) Assessment of pyrolysis oil as an energy source for diesel engines. Fuel Processing Technology, 90, 67-74.

Nacheff, M.S., Kraus, L.S., Ichikawa, M., Huffman, B.M., Butt, J.B., and Sachtler, W.M.H. (1987) Characterization and catalytic function of Re^0 and Re^{4+} in Re/Al_2O_3 and $PtRe/Al_2O_3$ catalysts. Journal of Catalysis, 106, 263-272.

Navarro, R.M., Castano, P., Alvarez-Galvan, M.C., and Pawelec, B. (2009) Hydrodesulfurization of dibenzothiophene and a SRGO on sulfide $Ni(Co)Mo/Al_2O_3$ catalysts. Effect of Ru and Pd promotion. Catalysis Today, 15, 108-114.

Ojeda, J., Escalona, N., Fierro, J.L.G., Agudo, A.L., and Gil-Llambias, F.J. (2005) Effect of the preparation of Re/γ-Al_2O_3 catalysts on the HDS and HDN of gas oil. Applied Catalysis A: General, 281, 25-30.

Okal, J., and Kubicka, H. (1998) Influence of oxidation–reduction treatment on activity and selectivity of Re supported on γ-alumina. Applied Catalysis A: General, 171, 351-359.

Onyestyak, G., Pal-Borbely, G., and Beyer, H.K. (2002) Cyclohexane conversion over H-zeolite supported platinum. Applied Catalysis A: General, 229, 63-74.

Pakdel, H., Pantea, D.M., and Roy, C. (2001) Production of *dl*-limonene by vacuum pyrolysis of used tires. Journal of Analytical and Applied Pyrolysis, 57, 91-107.

Pecoraro, T.A. and Chianelli, R.R. (1981) Hydrodesulfurization catalysis by transition metal sulfides. Journal of Catalysis, 67, 430 – 445.

Philippou, A. and Anderson, M.W. (1997) Solid-State NMR Investigation of Ethylbenzene Reactions over HMOR and Pt–HMOR Catalysts. Journal of Catalysis, 167, 266- 272.

Ponec, V. and Bond, G.C. (1995) Catalysis by Metals and Alloys, Elsevier, Amsterdam.

Qu, W., Zhou, Q., Wang, Y-Z., Zhang, J., Lan, W-W., Wu, Y-H., Yang, J-W., and Wang, D-Z. (2006) Pyrolysis of waste tire on ZSM-5 zeolite with enhanced catalytic activities. Polymer Degradation and Stability, 91, 2389-2395.

Rodriguez, I.M., Laresgoiti, M.F., Cabrero, M.A., Torres, A., Chomón, M.J., and Caballero, B. (2001) Pyrolysis of scrap tyres. Fuel Processing Technology, 72, 9-22.

Rodriguez-Castellon, E., Mérida-Robles, J., Díaz, L., Maireles-Torres, P., Jones, D.J., Rozière, J., and Jiménez-López, A. (2004) Hydrogenation and ring opening of tetralin on noble metal supported on zirconium doped mesoporous silica catalysts. Applied Catalysis A: General, 260, 9 -18.

Roy, C., Chaala, A., and Darmstadt, H.A. (1999) The vacuum pyrolysis of used tires: End-uses for oil and carbon black products. Journal of Analytical and Applied Pyrolysis, 51, 201-221.

Sajkowski, D.J., Lee, J.Y., Schwank, J., Tian, Y., and Goodwin Jr, J.W. (1986) The role of the zeolite in the hydrogenolysis of C_2 and C_3 hydrocarbons on RuNaY catalysts. Journal of Catalysis, 125, 549-560.

San Miguel, G., Aguado, J., Serrano, G.P., and Escola, J.M. (2006) Thermal and catalytic conversion of used tyre rubber and its polymeric constituents using Py-GC/MS. Applied Catalysis B: Environmental, 64, 209-219.

Sebor, G., Blazek, J., and Nemer, M.F. (1999) Optimization of the preparative separation of petroleum maltenes by liquid adsorption chromatography Journal of Chromatography A, 847, 323-330.

Sinfelt, J.H. (1983) Bimetallic Catalysts: Discovery, Concepts and Applications, Wiley, NewYork.

Teschner, D., Duprez, D., and Paal, Z. (2002) Reactivity of the hydrocarbon C–C bonds as a function of the reaction conditions in the conversion of C_6 alkanes and methylcyclopentane over Rh catalysts. Journal of Molecular Catalysis: A Chemical, 179, 201-212.

Williams, P.T. and Besler, S. (1995) Pyrolysis-thermogravimetric analysis of tyres and tyre components. Fuel, 14, 1277-1283.

Williams, P.T. and Bottrill, R.P. (1995) Sulfur-polycyclic aromatic hydrocarbons in tyre pyrolysis oil. Fuel, 74, 736-742.

Williams, P.T. and Brindle, A.J. (2002) Catalytic pyrolysis of tyres: influence of catalyst temperature. Fuel, 81, 2425-2434.

Williams, P.T. and Brindle, A.J. (2003) Aromatic chemicals from the catalytic pyrolysis of scrap tyres. Journal of Analytical and Applied Pyrolysis, 67, 143-164.

Williams, P.T. and Taylor, D.T. (1993) Aromatization of tyre pyrolysis oil to yield polycyclic aromatic hydrocarbons. Fuel, 72, 1469-1474.

Wu, J.C.S., Goodwin, J.G., and Davis, M. (1990) Zeolite A-supported Ru catalysts. Journal of Catalysis, 125, 488-500.

Yasuda, H., Sato, T., and Yoshimura, Y. (1999) Influence of the acidity of USY zeolite on the sulfur tolerance of Pd–Pt catalysts for aromatic hydrogenation. Catalysis Today, 50, 63-71.

Zheng, J., Guo, M., and Song, C. (2008) Characterization of Pd catalysts supported on USY zeolites with different SiO_2/Al_2O_3 ratios for the hydrogenation of naphthalene in the presence of benzothiophene. Fuel Processing Technology, 89, 467-474.

APPENDICES

A. PYROLYSIS

Table A1 Pyrolysis conditions: Non-catalytic Pyrolysis

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	27.4	24.6	32	358.8	506.3	62	355.8	500.8	92	356.5	500.4
4	29.1	30.2	34	361.7	500.8	64	355.6	500.4	94	357	500.2
6	34.7	44.2	36	346.9	491.3	66	356.1	500.9	96	358.2	499.3
8	46.6	69.7	38	349	505	68	358.2	501.2	98	357.2	499.9
10	67.2	119.9	40	352.8	504.5	70	360.7	501	100	353.6	501.5
12	91.1	146.4	42	356	503.4	72	364.4	500.7	102	344.8	502
14	121.6	194	44	353.4	505.2	74	363.3	502.5	104	347	501.4
16	150.6	248.9	46	349.4	500.7	76	358.3	500.6	106	350.9	502.5
18	179.6	309.7	48	350.6	507.3	78	352.5	502.3	108	352.9	501.7
20	211.8	378.9	50	350.9	502.5	80	348.7	499.4	110	350.9	500.8
22	259.9	436.1	52	351.2	501	82	345.3	503.5	112	349.5	501
24	307.4	454.7	54	351.8	497.1	84	345.5	503.1	114	349	501
26	344.5	513.5	56	353.6	495.4	86	345.9	501.2	116	345.4	500.9
28	342.2	503.7	58	355	502	88	351	501.5	118	348.6	502.6
30	343.6	502.7	60	355.6	500.4	90	356.3	502.4	120	349.4	502

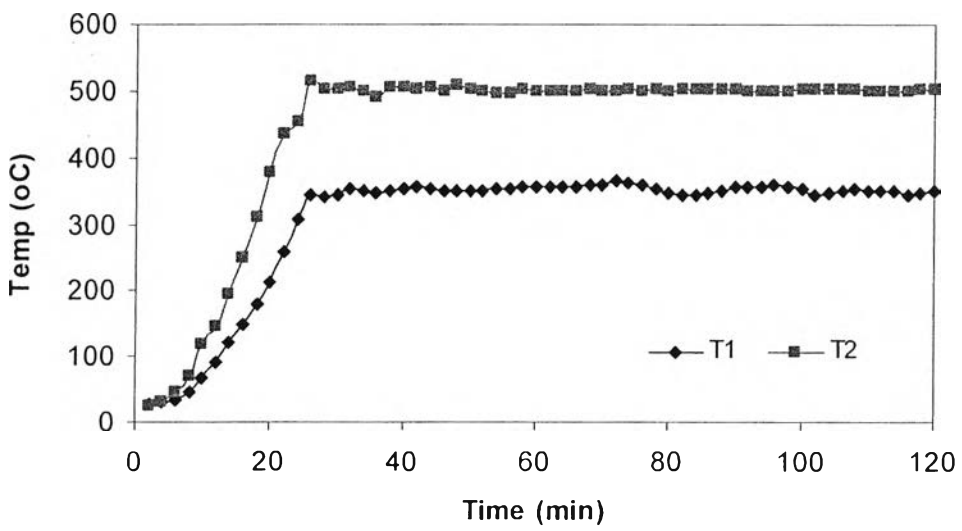


Figure A1 Operating temperatures vs. time on stream

Table A2 Pyrolysis conditions: Non-catalytic Pyrolysis

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 600°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	26.7	21.2	32	393.2	603.1	62	369.7	601.3	92	354.2	600.7
4	41.7	32.2	34	397	606.4	64	366.1	599.6	94	352.7	600.2
6	61.1	51.2	36	392	592.5	66	363.4	600.2	96	351.2	599.7
8	92.7	82.2	38	390	577.7	68	362.7	599.2	98	350.2	600.2
10	131.3	124.5	40	386.2	597.2	70	360.1	601.7	100	349.1	600
12	181.8	179.2	42	385	606.2	72	359.9	600.2	102	347	600.2
14	223.4	230.1	44	386.2	604.2	74	358.4	599.4	104	344.2	600.2
16	272	280.1	46	387.7	599.7	76	360.2	600.5	106	346.4	600.2
18	314.8	349.1	48	381.2	598.6	78	360.4	600.7	108	343.7	601.8
20	339.1	441.2	50	372.4	600	80	361	602.3	110	340.2	600
22	369.2	444.7	52	373	597.6	82	358.7	601.2	112	337.2	600.8
24	384.2	497.1	54	375.2	602.2	84	356.1	601	114	337.8	600.2
26	392.2	500.2	56	375.2	598	86	356.7	600.7	116	338.2	602.4
28	394.2	543.7	58	372	592.7	88	356.8	601.2	118	335.7	599.7
30	392.2	587.6	60	368.2	597.2	90	355.7	600.2	120	335.2	600

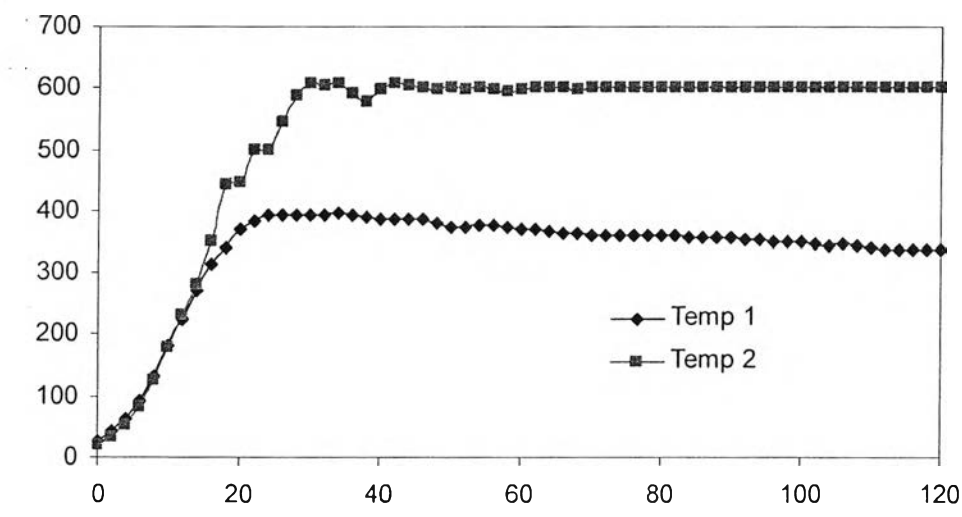


Figure A2 Operating temperatures vs. time on stream

Table A3 Pyrolysis conditions: Non-catalytic Pyrolysis

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 700°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	34.2	35	32	417	702	62	455.5	702	92	463.3	698.3
4	65.4	52	34	426.3	701.1	64	456.4	704.9	94	463.6	700.6
6	87.6	70.6	36	429	675.9	66	457.1	690.8	96	463.8	698
8	118	100.5	38	436	673.6	68	458	702	98	463.6	696.2
10	198.1	189.3	40	431.8	698.3	70	459	694.6	100	463.8	700
12	245.9	243.1	42	436	696.4	72	459.3	699.8	102	463.7	703.5
14	293.7	306.9	44	453.8	696.5	74	460	701.1	104	463.8	699.8
16	317.7	384.7	46	443.2	703.3	76	460.8	703.5	106	463.9	694.6
18	356	447.3	48	446.1	698.7	78	461.1	694.2	108	463.9	701.3
20	370.3	472.9	50	448.2	691.5	80	461.5	700.3	110	464.1	696.4
22	385.1	512.6	52	450.2	674.6	82	462.2	704.4	112	464.5	700
24	410	551.7	54	451.5	710.3	84	462	697.5	114	464.1	693.8
26	409	607	56	451	711.9	86	463.7	700.8	116	463.8	697.6
28	414	649	58	452.7	699.1	88	463	700	118	464.5	703.2
30	418	682.2	60	454.2	693.9	90	462.9	695.1	120	464.3	691.5

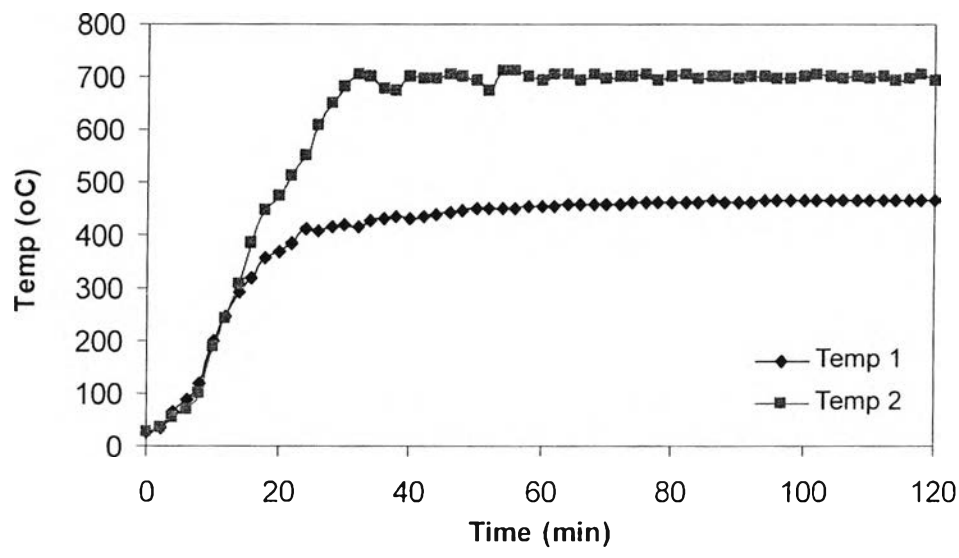


Figure A3 Operating temperatures vs. time on stream

Table A4 Pyrolysis conditions: Catalytic Pyrolysis using HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	30.2	31.3	32	362.8	501.9	62	356.7	501.5	92	358.1	500.5
4	35.8	45.3	34	348	492.4	64	357.2	502	94	346.4	346.4
6	47.7	70.8	36	350.1	506.1	66	359.3	502.3	96	346.4	346.4
8	68.3	121	38	353.9	505.6	68	361.8	502.1	98	346.4	346.4
10	92.2	147.5	40	357.1	504.5	70	365.5	501.8	100	346.4	346.4
12	122.7	195.1	42	354.5	506.3	72	364.4	503.6	102	346.4	346.4
14	151.7	250	44	350.5	501.8	74	359.4	501.7	104	346.4	346.4
16	180.7	310.8	46	351.7	508.4	76	353.6	503.4	106	346.4	346.4
18	212.9	380	48	352	503.6	78	349.8	500.5	108	346.4	346.4
20	261	437.2	50	352.3	502.1	80	346.4	504.6	110	346.4	346.4
22	308.5	455.8	52	352.9	498.2	82	346.6	504.2	112	346.4	346.4
24	345.6	514.6	54	354.7	496.5	84	347	502.3	114	346.4	346.4
26	343.3	504.8	56	356.1	503.1	86	352.1	502.6	116	346.4	346.4
28	344.7	503.8	58	356.7	501.5	88	357.4	503.5	118	346.4	346.4
30	359.9	507.4	60	356.9	501.9	90	357.6	501.5	120	346.4	346.4

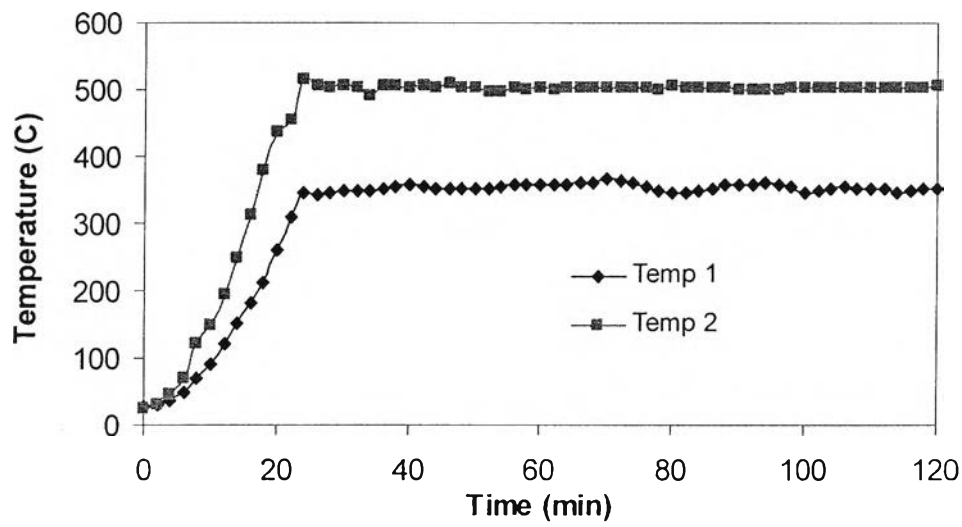


Figure A4 Operating temperatures vs. time on stream

Table A5 Pyrolysis conditions: Catalytic Pyrolysis using Ru/HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	28.3	29.0	32	360.9	499.6	62	354.8	499.2	92	356.2	499
4	33.9	43.0	34	346.1	490.1	64	355.3	499.7	94	357.4	498.1
6	45.8	68.5	36	348.2	503.8	66	357.4	500	96	356.4	498.7
8	66.4	118.7	38	352.0	503.3	68	359.9	499.8	98	352.8	500.3
10	90.3	145.2	40	355.2	502.2	70	363.6	499.5	100	344	500.8
12	120.8	192.8	42	352.6	504.0	72	362.5	501.3	102	346.2	500.2
14	149.8	247.7	44	348.6	499.5	74	357.5	499.4	104	350.1	501.3
16	178.8	308.5	46	349.8	506.1	76	351.7	501.1	106	352.1	500.5
18	211.0	377.7	48	350.1	501.3	78	347.9	498.2	108	350.1	499.6
20	259.1	434.9	50	350.4	499.8	80	344.5	502.3	110	348.7	499.8
22	306.6	453.5	52	351.0	495.9	82	344.7	501.9	112	348.2	499.8
24	343.7	512.3	54	352.8	494.2	84	345.1	500	114	344.6	499.7
26	341.4	502.5	56	354.2	500.8	86	350.2	500.3	116	347.8	501.4
28	342.8	501.5	58	354.8	499.2	88	355.5	501.2	118	348.6	500.8
30	358.0	505.1	60	355.0	499.6	90	355.7	499.2	120	349.1	503

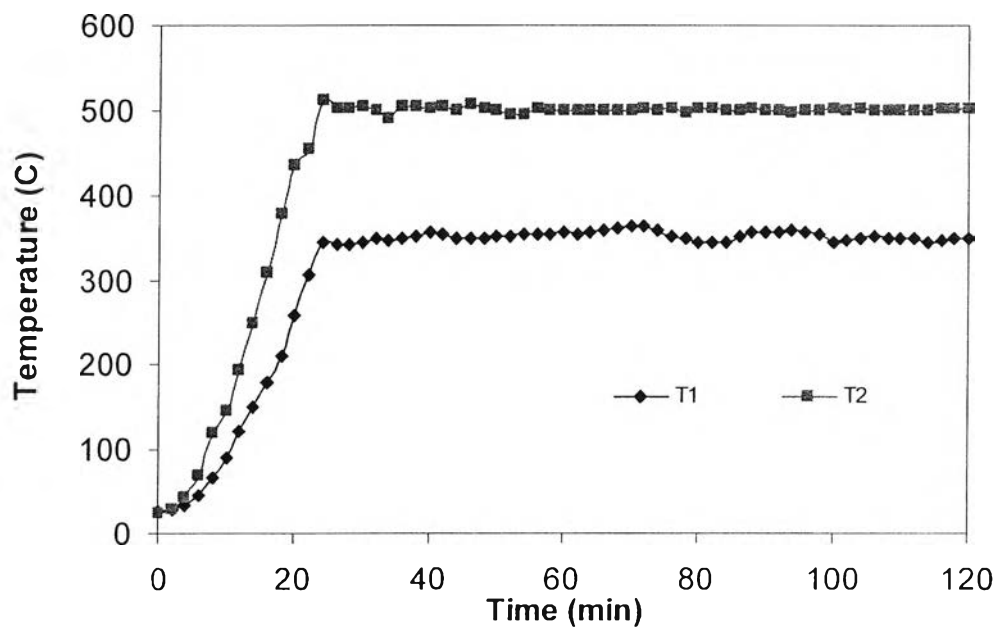


Figure A5 Operating temperatures vs. time on stream

Table A6 Pyrolysis conditions: Catalytic Pyrolysis Using Pt/HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	33.2	33.2	32	365.8	503.8	62	359.7	503.4	92	361.1	503.2
4	38.8	47.2	34	351	494.3	64	360.2	503.9	94	362.3	502.3
6	50.7	72.7	36	353.1	508	66	362.3	504.2	96	361.3	502.9
8	71.3	122.9	38	356.9	507.5	68	364.8	504	98	357.7	504.5
10	95.2	149.4	40	360.1	506.4	70	368.5	503.7	100	348.9	505
12	125.7	197	42	357.5	508.2	72	367.4	505.5	102	351.1	504.4
14	154.7	251.9	44	353.5	503.7	74	362.4	503.6	104	355	505.5
16	183.7	312.7	46	354.7	510.3	76	356.6	505.3	106	357	504.7
18	215.9	381.9	48	355	505.5	78	352.8	502.4	108	355	503.8
20	264	439.1	50	355.3	504	80	349.4	506.5	110	353.6	504
22	311.5	457.7	52	355.9	500.1	82	349.6	506.1	112	353.1	504
24	348.6	516.5	54	357.7	498.4	84	350	504.2	114	349.5	503.9
26	346.3	506.7	56	359.1	505	86	355.1	504.5	116	352.7	505.6
28	347.7	505.7	58	359.7	503.4	88	360.4	505.4	118	353.5	505
30	362.9	509.3	60	359.9	503.8	90	360.6	503.4	120	354	507.2

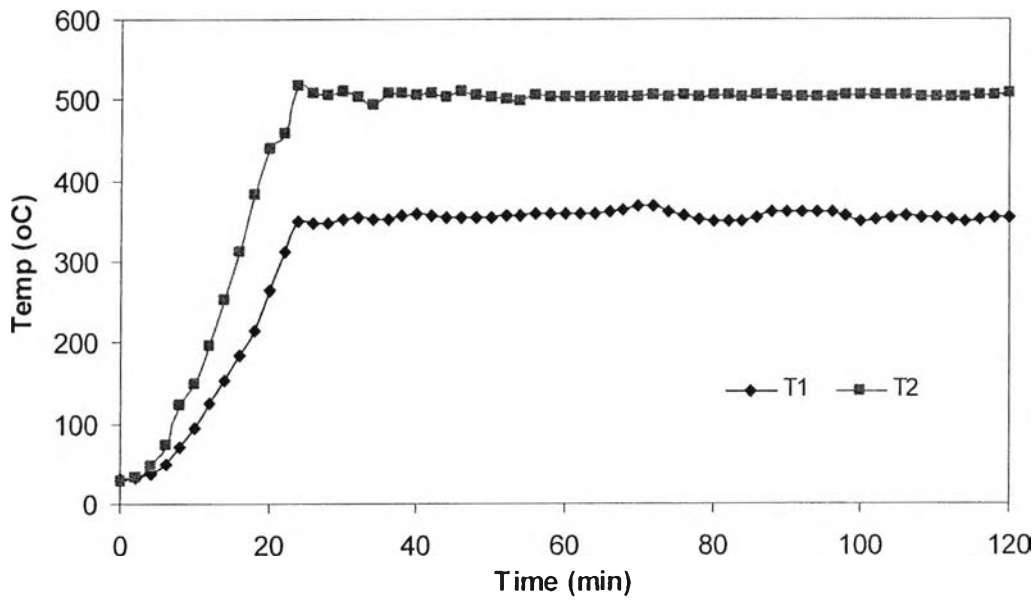


Figure A6 Operating temperatures vs. time on stream

Table A7 Pyrolysis conditions: Catalytic Pyrolysis Using Rh/HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	30.9	30.5	32	363.5	501.1	62	357.4	500.7	92	358.8	500.5
4	36.5	44.5	34	348.7	491.6	64	357.9	501.2	94	360	499.6
6	48.4	70	36	350.8	505.3	66	360	501.5	96	359	500.2
8	69	120.2	38	354.6	504.8	68	362.5	501.3	98	355.4	501.8
10	92.9	146.7	40	357.8	503.7	70	366.2	501	100	346.6	502.3
12	123.4	194.3	42	355.2	505.5	72	365.1	502.8	102	348.8	501.7
14	152.4	249.2	44	351.2	501	74	360.1	500.9	104	352.7	502.8
16	181.4	310	46	352.4	507.6	76	354.3	502.6	106	354.7	502
18	213.6	379.2	48	352.7	502.8	78	350.5	499.7	108	352.7	501.1
20	261.7	436.4	50	353	501.3	80	347.1	503.8	110	351.3	501.3
22	309.2	455	52	353.6	497.4	82	347.3	503.4	112	350.8	501.3
24	346.3	513.8	54	355.4	495.7	84	347.7	501.5	114	347.2	501.2
26	344	504	56	356.8	502.3	86	352.8	501.8	116	350.4	502.9
28	345.4	503	58	357.4	500.7	88	358.1	502.7	118	351.2	502.3
30	360.6	506.6	60	357.6	501.1	90	358.3	500.7	120	351.7	504.5

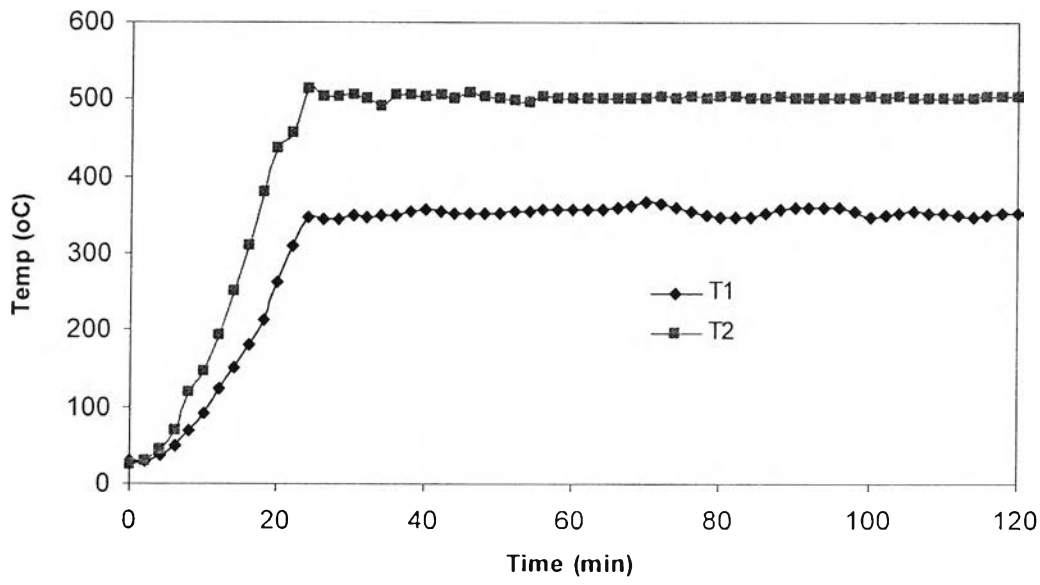


Figure A7 Operating temperatures vs. time on stream

Table A8 Pyrolysis conditions: Catalytic Pyrolysis Using Re/HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	33.4	35.4	32	366	506	62	359.9	505.6	92	361.3	505.4
4	39	49.4	34	351.2	496.5	64	360.4	506.1	94	362.5	504.5
6	50.9	74.9	36	353.3	510.2	66	362.5	506.4	96	361.5	505.1
8	71.5	125.1	38	357.1	509.7	68	365	506.2	98	357.9	506.7
10	95.4	151.6	40	360.3	508.6	70	368.7	505.9	100	349.1	507.2
12	125.9	199.2	42	357.7	510.4	72	367.6	507.7	102	351.3	506.6
14	154.9	254.1	44	353.7	505.9	74	362.6	505.8	104	355.2	507.7
16	183.9	314.9	46	354.9	512.5	76	356.8	507.5	106	357.2	506.9
18	216.1	384.1	48	355.2	507.7	78	353	504.6	108	355.2	506
20	264.2	441.3	50	355.5	506.2	80	349.6	508.7	110	353.8	506.2
22	311.7	459.9	52	356.1	502.3	82	349.8	508.3	112	353.3	506.2
24	348.8	518.7	54	357.9	500.6	84	350.2	506.4	114	349.7	506.1
26	346.5	508.9	56	359.3	507.2	86	355.3	506.7	116	352.9	507.8
28	347.9	507.9	58	359.9	505.6	88	360.6	507.6	118	353.7	507.2
30	363.1	511.5	60	360.1	506	90	360.8	505.6	120	354.2	509.4

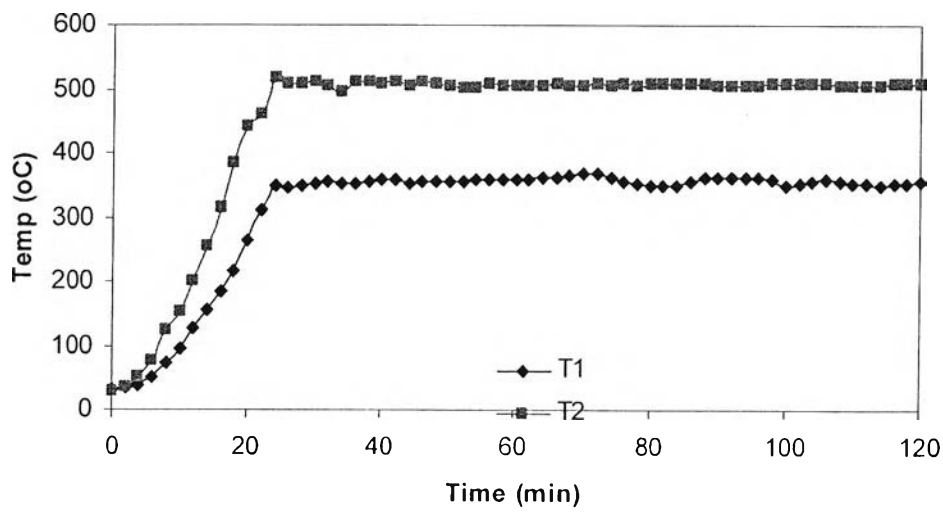


Figure A8 Operating temperatures vs. time on stream

Table A9 Pyrolysis conditions: Catalytic Pyrolysis Using MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	31.1	31.6	32	363.7	502.2	62	357.6	501.8	92	359	501.6
4	36.7	45.6	34	348.9	492.7	64	358.1	502.3	94	360.2	500.7
6	48.6	71.1	36	351	506.4	66	360.2	502.6	96	359.2	501.3
8	69.2	121.3	38	354.8	505.9	68	362.7	502.4	98	355.6	502.9
10	93.1	147.8	40	358	504.8	70	366.4	502.1	100	346.8	503.4
12	123.6	195.4	42	355.4	506.6	72	365.3	503.9	102	349	502.8
14	152.6	250.3	44	351.4	502.1	74	360.3	502	104	352.9	503.9
16	181.6	311.1	46	352.6	508.7	76	354.5	503.7	106	354.9	503.1
18	213.8	380.3	48	352.9	503.9	78	350.7	500.8	108	352.9	502.2
20	261.9	437.5	50	353.2	502.4	80	347.3	504.9	110	351.5	502.4
22	309.4	456.1	52	353.8	498.5	82	347.5	504.5	112	351	502.4
24	346.5	514.9	54	355.6	496.8	84	347.9	502.6	114	347.4	502.3
26	344.2	505.1	56	357	503.4	86	353	502.9	116	350.6	504
28	345.6	504.1	58	357.6	501.8	88	358.3	503.8	118	351.4	503.4
30	360.8	507.7	60	357.8	502.2	90	358.5	501.8	120	351.9	505.6

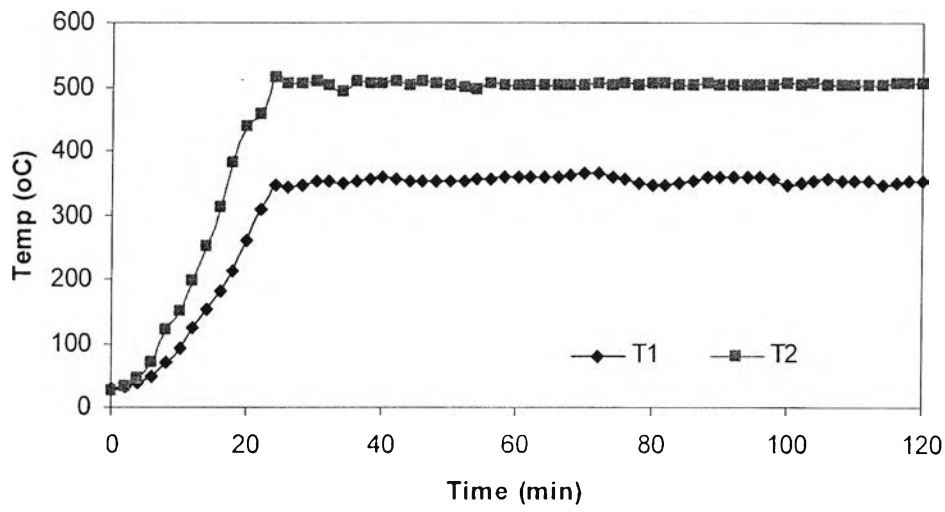


Figure A9 Operating temperatures vs. time on stream

Table A10 Pyrolysis conditions: Catalytic Pyrolysis Using MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 400°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	31.8	33	32	382.4	494	62	406.3	500	92	412.8	500
4	37.4	50	34	387.6	500	64	406.8	500	94	414	500
6	49.3	80	36	389.7	503	66	408.9	500	96	413	500
8	69.9	135	38	393.5	505	68	411.4	500	98	409.4	500
10	93.8	174	40	396.7	500	70	415.1	499	100	400.6	500
12	124.3	235	42	404.1	498	72	414	501	102	402.8	500
14	153.3	300	44	400.1	500	74	409	501	104	406.7	501
16	182.3	363	46	401.3	507	76	403.2	500	106	408.7	501
18	214.5	440	48	401.6	500	78	399.4	500	108	406.7	499
20	273.1	474	50	401.9	500	80	401.1	500	110	405.3	500
22	320.6	510	52	402.5	497	82	401.3	501	112	404.8	500
24	357.7	509	54	404.3	495	84	401.7	499	114	401.2	500
26	355.4	500	56	405.7	500	86	406.8	501	116	404.4	500
28	356.8	506	58	406.3	500	88	412.1	499	118	405.2	500
30	372	503	60	406.5	500	90	412.3	500	120	405.7	500

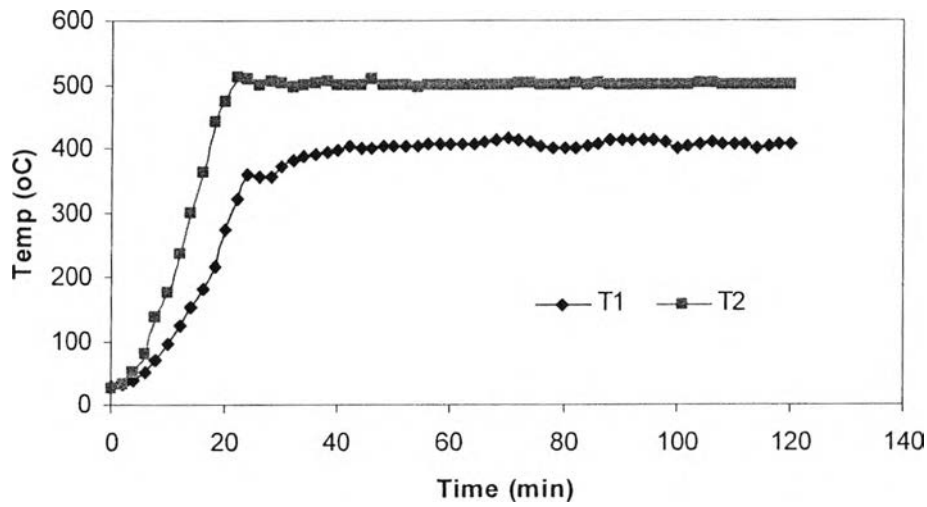


Figure A10 Operating temperatures vs. time on stream

Table A11 Pyrolysis conditions: Catalytic Pyrolysis Using MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 450°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	28	33	32	381	494	62	375	500	92	352	500
4	32	50	34	383	500	64	374	500	94	351	500
6	41	80	36	386	503	66	372	500	96	350	500
8	62	135	38	387	505	68	370	500	98	349	500
10	80	174	40	388	500	70	369	499	100	347	500
12	115	235	42	388	498	72	368	501	102	346	500
14	145	300	44	387	500	74	366	501	104	344	501
16	173	363	46	387	507	76	365	500	106	343	501
18	210	440	48	386	500	78	363	500	108	341	499
20	270	474	50	386	500	80	362	500	110	340	500
22	330	510	52	385	497	82	361	501	112	339	500
24	359	509	54	384	495	84	359	499	114	338	500
26	369	500	56	383	500	86	357	501	116	337	500
28	375	506	58	381	500	88	356	499	118	335	500
30	377	503	60	380	500	90	354	500	120	334	500

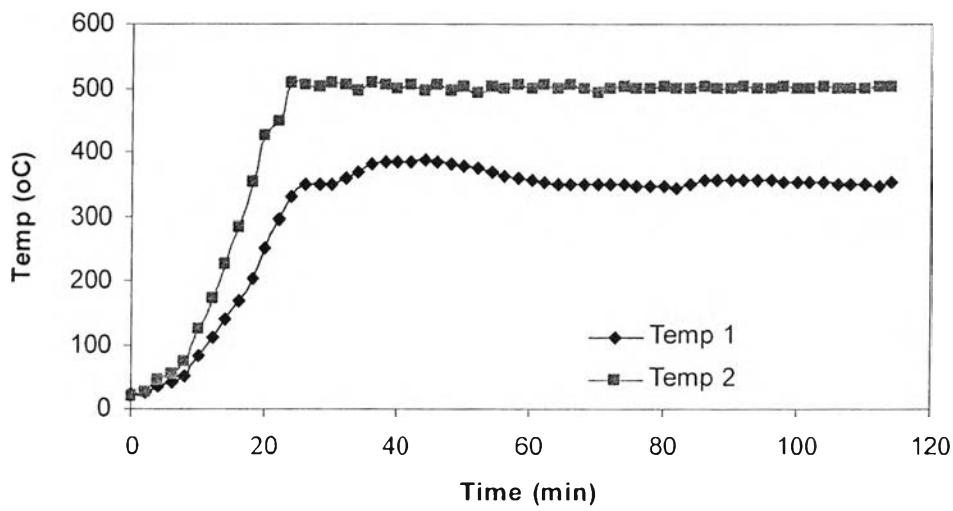


Figure A11 Operating temperatures vs. time on stream

Table A12 Pyrolysis conditions: Catalytic Pyrolysis Using 1%Ru/MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	28.6	28.1	32	360	509.8	62	357	504.3	92	357.7	503.9
4	30.3	33.7	34	362.9	504.3	64	356.8	503.9	94	358.2	503.7
6	35.9	47.7	36	348.1	494.8	66	357.3	504.4	96	359.4	502.8
8	47.8	73.2	38	350.2	508.5	68	359.4	504.7	98	358.4	503.4
10	68.4	123.4	40	354	508	70	361.9	504.5	100	354.8	505
12	92.3	149.9	42	357.2	506.9	72	365.6	504.2	102	346	505.5
14	122.8	197.5	44	354.6	508.7	74	364.5	506	104	348.2	504.9
16	151.8	252.4	46	350.6	504.2	76	359.5	504.1	106	352.1	506
18	180.8	313.2	48	351.8	510.8	78	353.7	505.8	108	354.1	505.2
20	213	382.4	50	352.1	506	80	349.9	502.9	110	352.1	504.3
22	261.1	439.6	52	352.4	504.5	82	346.5	507	112	350.7	504.5
24	308.6	458.2	54	353	500.6	84	346.7	506.6	114	350.2	504.5
26	345.7	517	56	354.8	498.9	86	347.1	504.7	116	346.6	504.4
28	343.4	507.2	58	356.2	505.5	88	352.2	505	118	349.8	506.1
30	344.8	506.2	60	356.8	503.9	90	357.5	505.9	120	350.6	505.5

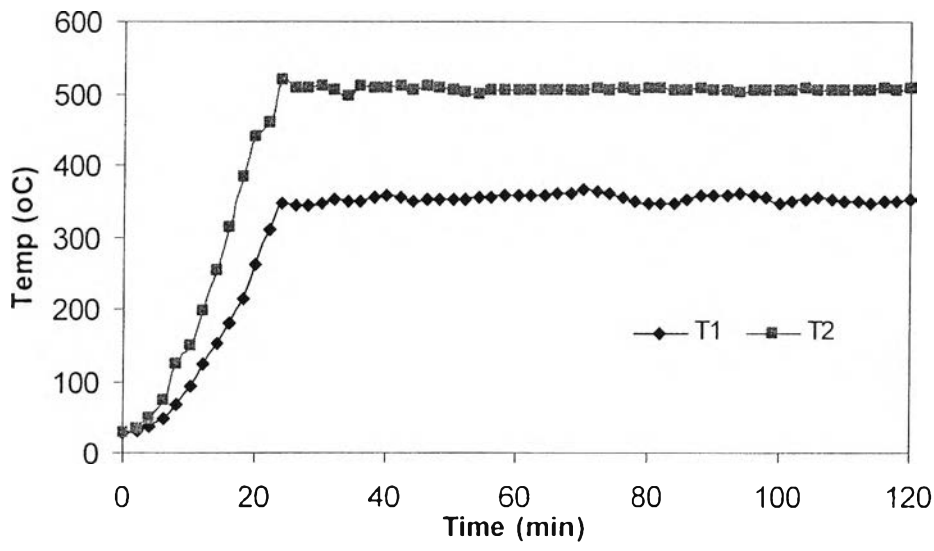


Figure A12 Operating temperatures vs. time on stream

Table A13 Pyrolysis conditions: Catalytic Pyrolysis Using 1.5%Ru/MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	32.2	36.6	32	364.8	507.2	62	358.7	506.8	92	360.1	506.6
4	37.8	50.6	34	350	497.7	64	359.2	507.3	94	361.3	505.7
6	49.7	76.1	36	352.1	511.4	66	361.3	507.6	96	360.3	506.3
8	70.3	126.3	38	355.9	510.9	68	363.8	507.4	98	356.7	507.9
10	94.2	152.8	40	359.1	509.8	70	367.5	507.1	100	347.9	508.4
12	124.7	200.4	42	356.5	511.6	72	366.4	508.9	102	350.1	507.8
14	153.7	255.3	44	352.5	507.1	74	361.4	507	104	354	508.9
16	182.7	316.1	46	353.7	513.7	76	355.6	508.7	106	356	508.1
18	214.9	385.3	48	354	508.9	78	351.8	505.8	108	354	507.2
20	263	442.5	50	354.3	507.4	80	348.4	509.9	110	352.6	507.4
22	310.5	461.1	52	354.9	503.5	82	348.6	509.5	112	352.1	507.4
24	347.6	519.9	54	356.7	501.8	84	349	507.6	114	348.5	507.3
26	345.3	510.1	56	358.1	508.4	86	354.1	507.9	116	351.7	509
28	346.7	509.1	58	358.7	506.8	88	359.4	508.8	118	352.5	508.4
30	361.9	512.7	60	358.9	507.2	90	359.6	506.8	120	353	510.6

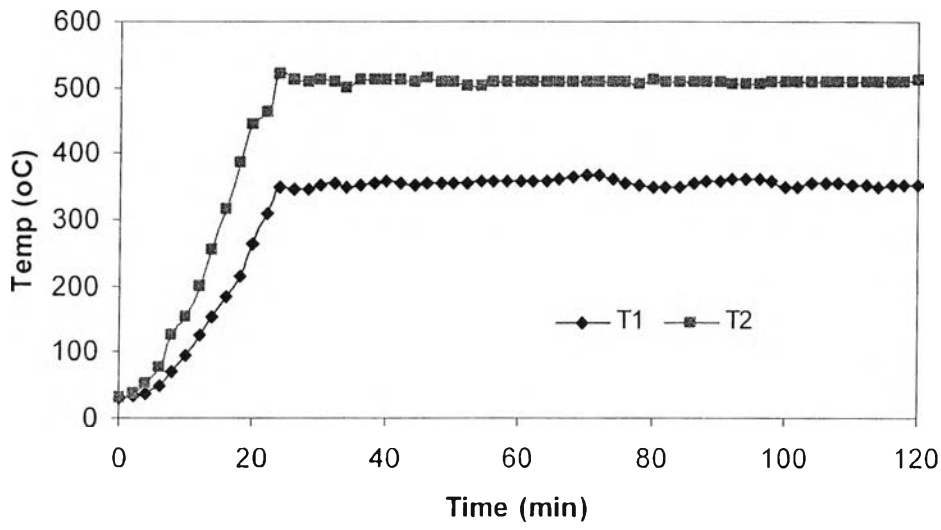


Figure A13 Operating temperatures vs. time on stream

Table A14 Pyrolysis conditions: Catalytic Pyrolysis Using 2%Ru/MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	30.1	36.7	32	362.7	507.3	62	356.6	506.9	92	358	506.7
4	35.7	50.7	34	347.9	497.8	64	357.1	507.4	94	359.2	505.8
6	47.6	76.2	36	350	511.5	66	359.2	507.7	96	358.2	506.4
8	68.2	126.4	38	353.8	511	68	361.7	507.5	98	354.6	508
10	92.1	152.9	40	357	509.9	70	365.4	507.2	100	345.8	508.5
12	122.6	200.5	42	354.4	511.7	72	364.3	509	102	348	507.9
14	151.6	255.4	44	350.4	507.2	74	359.3	507.1	104	351.9	509
16	180.6	316.2	46	351.6	513.8	76	353.5	508.8	106	353.9	508.2
18	212.8	385.4	48	351.9	509	78	349.7	505.9	108	351.9	507.3
20	260.9	442.6	50	352.2	507.5	80	346.3	510	110	350.5	507.5
22	308.4	461.2	52	352.8	503.6	82	346.5	509.6	112	350	507.5
24	345.5	520	54	354.6	501.9	84	346.9	507.7	114	346.4	507.4
26	343.2	510.2	56	356	508.5	86	352	508	116	349.6	509.1
28	344.6	509.2	58	356.6	506.9	88	357.3	508.9	118	350.4	508.5
30	359.8	512.8	60	356.8	507.3	90	357.5	506.9	120	350.9	510.7

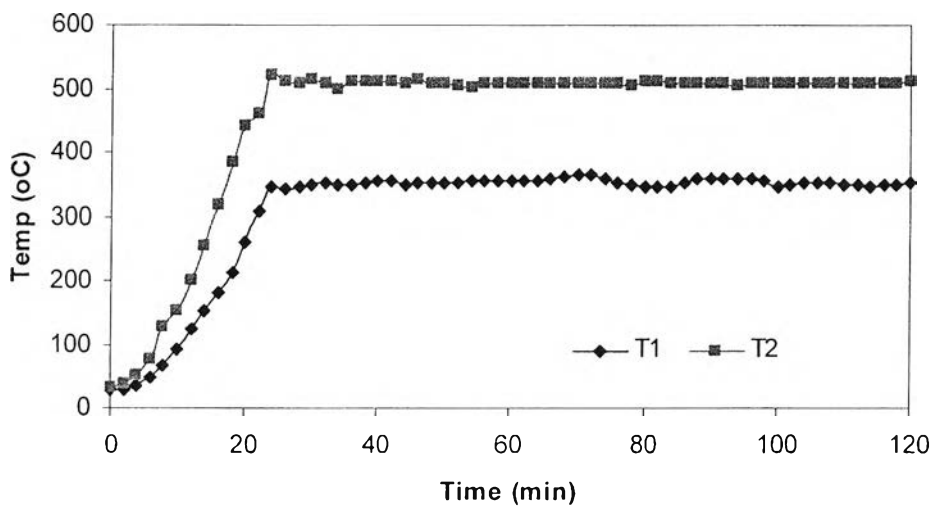


Figure A14 Operating temperatures vs. time on stream

Table A15 Pyrolysis conditions: Catalytic Pyrolysis Using SBA-1

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	31.3	36.5	32	363.9	507.1	62	357.8	506.7	92	359.2	506.5
4	36.9	50.5	34	349.1	497.6	64	358.3	507.2	94	360.4	505.6
6	48.8	76.0	36	351.2	511.3	66	360.4	507.5	96	359.4	506.2
8	69.4	126.2	38	355.0	510.8	68	362.9	507.3	98	355.8	507.8
10	93.3	152.7	40	358.2	509.7	70	366.6	507	100	347	508.3
12	123.8	200.3	42	355.6	511.5	72	365.5	508.8	102	349.2	507.7
14	152.8	255.2	44	351.6	507.0	74	360.5	506.9	104	353.1	508.8
16	181.8	316.0	46	352.8	513.6	76	354.7	508.6	106	355.1	508
18	214.0	385.2	48	353.1	508.8	78	350.9	505.7	108	353.1	507.1
20	262.1	442.4	50	353.4	507.3	80	347.5	509.8	110	351.7	507.3
22	309.6	461.0	52	354.0	503.4	82	347.7	509.4	112	351.2	507.3
24	346.7	519.8	54	355.8	501.7	84	348.1	507.5	114	347.6	507.2
26	344.4	510.0	56	357.2	508.3	86	353.2	507.8	116	350.8	508.9
28	345.8	509.0	58	357.8	506.7	88	358.5	508.7	118	351.6	508.3
30	361.0	512.6	60	358.0	507.1	90	358.7	506.7	120	352.1	510.5

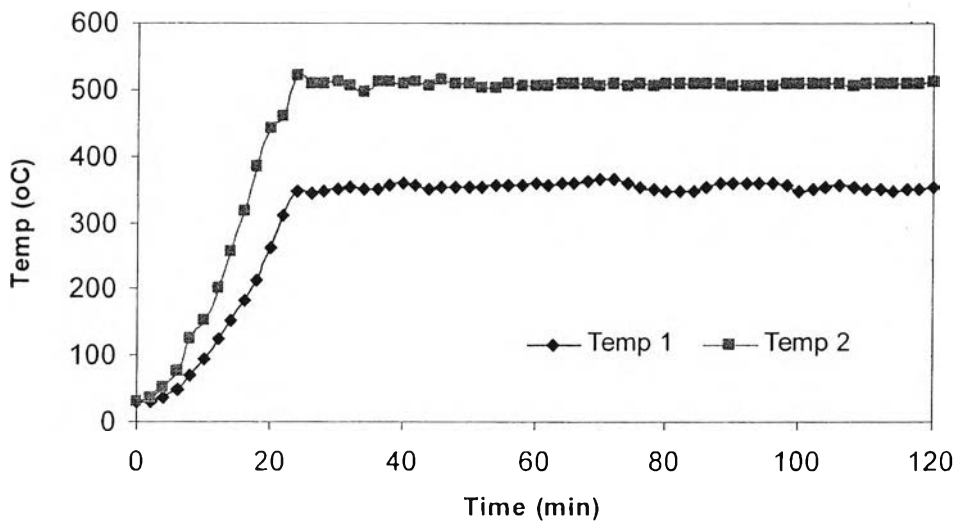


Figure A15 Operating temperatures vs. time on stream

Table A16 Pyrolysis conditions: Catalytic Pyrolysis Using 2.5Ru/SBA-1

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	26.5	32	32	359.1	502.6	62	353	502.2	92	354.4	502
4	32.1	46	34	344.3	493.1	64	353.5	502.7	94	355.6	501.1
6	44	71.5	36	346.4	506.8	66	355.6	503	96	354.6	501.7
8	64.6	121.7	38	350.2	506.3	68	358.1	502.8	98	351	503.3
10	88.5	148.2	40	353.4	505.2	70	361.8	502.5	100	342.2	503.8
12	119	195.8	42	350.8	507	72	360.7	504.3	102	344.4	503.2
14	148	250.7	44	346.8	502.5	74	355.7	502.4	104	348.3	504.3
16	177	311.5	46	348	509.1	76	349.9	504.1	106	350.3	503.5
18	209.2	380.7	48	348.3	504.3	78	346.1	501.2	108	348.3	502.6
20	257.3	437.9	50	348.6	502.8	80	342.7	505.3	110	346.9	502.8
22	304.8	456.5	52	349.2	498.9	82	342.9	504.9	112	346.4	502.8
24	341.9	515.3	54	351	497.2	84	343.3	503	114	342.8	502.7
26	339.6	505.5	56	352.4	503.8	86	348.4	503.3	116	346	504.4
28	341	504.5	58	353	502.2	88	353.7	504.2	118	346.8	503.8
30	356.2	508.1	60	353.2	502.6	90	353.9	502.2	120	347.3	506

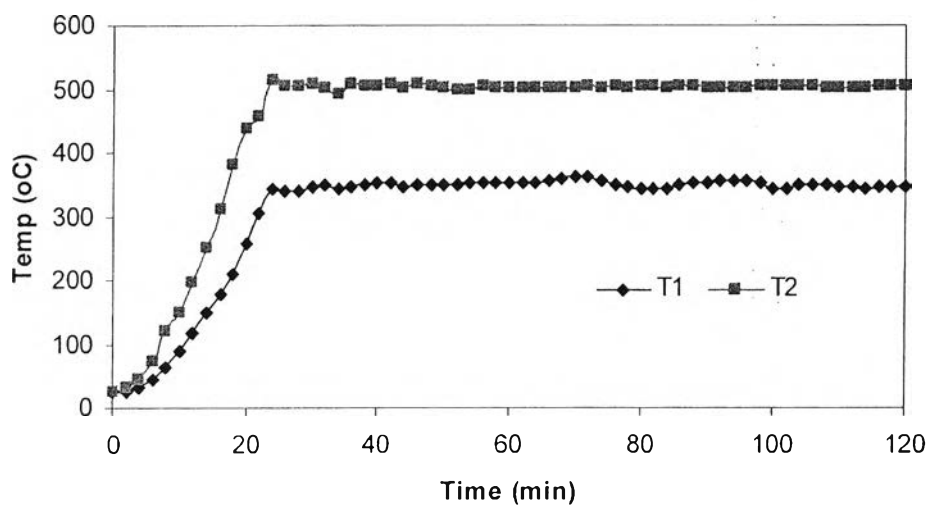


Figure A16 Operating temperatures vs. time on stream

Table A17 Pyrolysis conditions: Catalytic Pyrolysis Using 4.0Ru/SBA-1

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	28.7	34.7	32	361.3	505.3	62	355.2	504.9	92	356.6	504.7
4	34.3	48.7	34	346.5	495.8	64	355.7	505.4	94	357.8	503.8
6	46.2	74.2	36	348.6	509.5	66	357.8	505.7	96	356.8	504.4
8	66.8	124.4	38	352.4	509.0	68	360.3	505.5	98	353.2	506
10	90.7	150.9	40	355.6	507.9	70	364	505.2	100	344.4	506.5
12	121.2	198.5	42	353.0	509.7	72	362.9	507	102	346.6	505.9
14	150.2	253.4	44	349.0	505.2	74	357.9	505.1	104	350.5	507
16	179.2	314.2	46	350.2	511.8	76	352.1	506.8	106	352.5	506.2
18	211.4	383.4	48	350.5	507.0	78	348.3	503.9	108	350.5	505.3
20	259.5	440.6	50	350.8	505.5	80	344.9	508	110	349.1	505.5
22	307.0	459.2	52	351.4	501.6	82	345.1	507.6	112	348.6	505.5
24	344.1	518.0	54	353.2	499.9	84	345.5	505.7	114	345	505.4
26	341.8	508.2	56	354.6	506.5	86	350.6	506	116	348.2	507.1
28	343.2	507.2	58	355.2	504.9	88	355.9	506.9	118	349	506.5
30	358.4	510.8	60	355.4	505.3	90	356.1	504.9	120	349.5	508.7

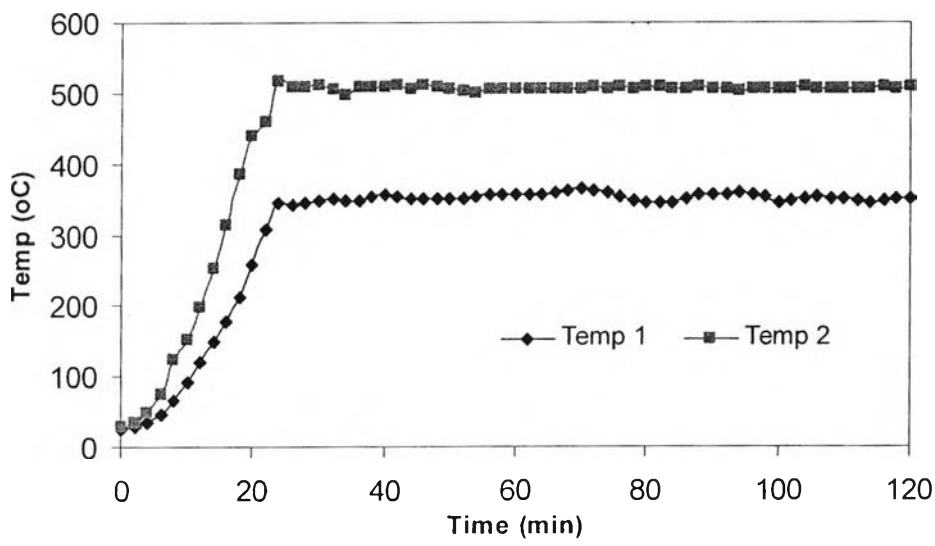


Figure A17 Operating temperatures vs. time on stream

Table A18 Pyrolysis conditions: Catalytic Pyrolysis Using 4.5Ru/SBA-1

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	32.2	35.6	32	364.8	506.2	62	358.7	505.8	92	360.1	505.6
4	37.8	49.6	34	350	496.7	64	359.2	506.3	94	361.3	504.7
6	49.7	75.1	36	352.1	510.4	66	361.3	506.6	96	360.3	505.3
8	70.3	125.3	38	355.9	509.9	68	363.8	506.4	98	356.7	506.9
10	94.2	151.8	40	359.1	508.8	70	367.5	506.1	100	347.9	507.4
12	124.7	199.4	42	356.5	510.6	72	366.4	507.9	102	350.1	506.8
14	153.7	254.3	44	352.5	506.1	74	361.4	506	104	354	507.9
16	182.7	315.1	46	353.7	512.7	76	355.6	507.7	106	356	507.1
18	214.9	384.3	48	354	507.9	78	351.8	504.8	108	354	506.2
20	263	441.5	50	354.3	506.4	80	348.4	508.9	110	352.6	506.4
22	310.5	460.1	52	354.9	502.5	82	348.6	508.5	112	352.1	506.4
24	347.6	518.9	54	356.7	500.8	84	349	506.6	114	348.5	506.3
26	345.3	509.1	56	358.1	507.4	86	354.1	506.9	116	351.7	508
28	346.7	508.1	58	358.7	505.8	88	359.4	507.8	118	352.5	507.4
30	361.9	511.7	60	358.9	506.2	90	359.6	505.8	120	353	509.6

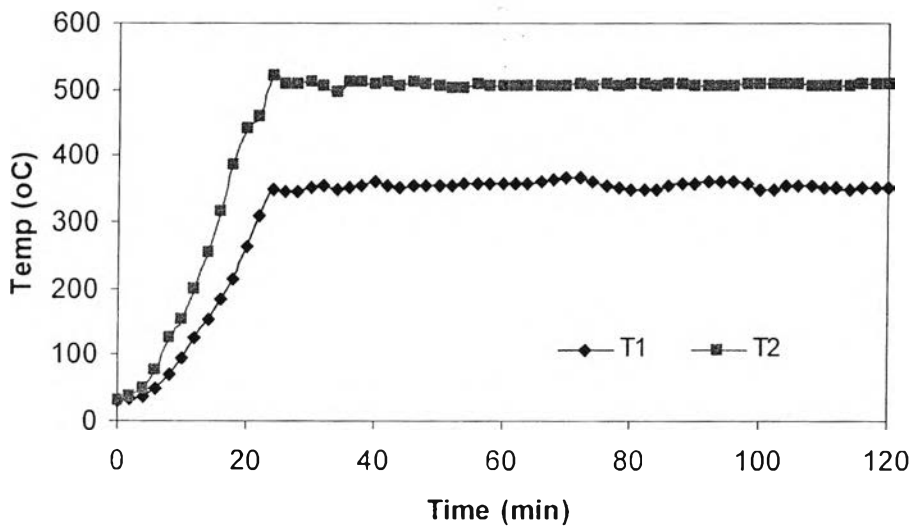


Figure A18 Operating temperatures vs. time on stream

Table A19 Pyrolysis conditions: Catalytic Pyrolysis Using HBETA

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	30.5	36.1	32	363.1	506.7	62	357	506.3	92	358.4	506.1
4	36.1	50.1	34	348.3	497.2	64	357.5	506.8	94	359.6	505.2
6	48.0	75.6	36	350.4	510.9	66	359.6	507.1	96	358.6	505.8
8	68.6	125.8	38	354.2	510.4	68	362.1	506.9	98	355	507.4
10	92.5	152.3	40	357.4	509.3	70	365.8	506.6	100	346.2	507.9
12	123.0	199.9	42	354.8	511.1	72	364.7	508.4	102	348.4	507.3
14	152.0	254.8	44	350.8	506.6	74	359.7	506.5	104	352.3	508.4
16	181.0	315.6	46	352.0	513.2	76	353.9	508.2	106	354.3	507.6
18	213.2	384.8	48	352.3	508.4	78	350.1	505.3	108	352.3	506.7
20	261.3	442.0	50	352.6	506.9	80	346.7	509.4	110	350.9	506.9
22	308.8	460.6	52	353.2	503.0	82	346.9	509	112	350.4	506.9
24	345.9	519.4	54	355.0	501.3	84	347.3	507.1	114	346.8	506.8
26	343.6	509.6	56	356.4	507.9	86	352.4	507.4	116	350	508.5
28	345.0	508.6	58	357.0	506.3	88	357.7	508.3	118	350.8	507.9
30	360.2	512.2	60	357.2	506.7	90	357.9	506.3	120	351.3	510.1

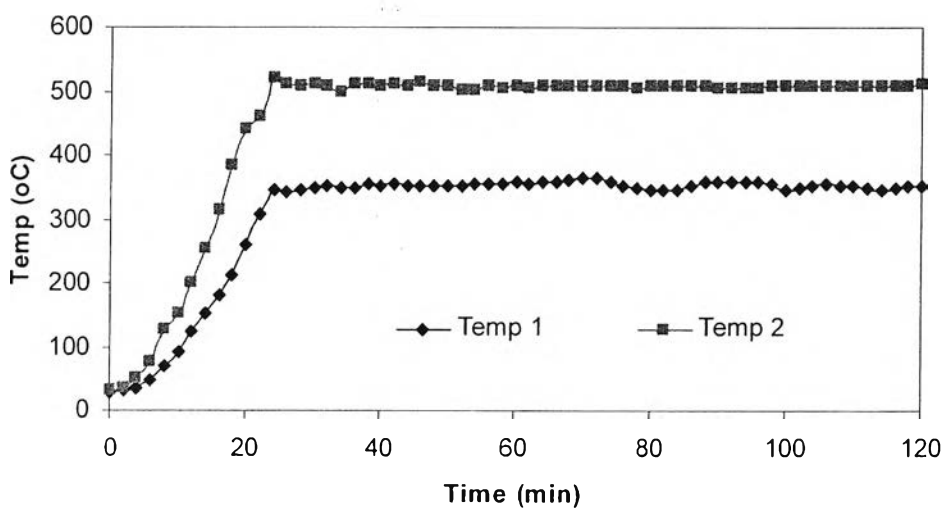


Figure A19 Operating temperatures vs. time on stream

Table A20 Pyrolysis conditions: Catalytic Pyrolysis Using Pt/HBETA

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	33.5	37.1	32	366.1	507.7	62	360	507.3	92	361.4	507.1
4	39.1	51.1	34	351.3	498.2	64	360.5	507.8	94	362.6	506.2
6	51	76.6	36	353.4	511.9	66	362.6	508.1	96	361.6	506.8
8	71.6	126.8	38	357.2	511.4	68	365.1	507.9	98	358	508.4
10	95.5	153.3	40	360.4	510.3	70	368.8	507.6	100	349.2	508.9
12	126	200.9	42	357.8	512.1	72	367.7	509.4	102	351.4	508.3
14	155	255.8	44	353.8	507.6	74	362.7	507.5	104	355.3	509.4
16	184	316.6	46	355	514.2	76	356.9	509.2	106	357.3	508.6
18	216.2	385.8	48	355.3	509.4	78	353.1	506.3	108	355.3	507.7
20	264.3	443	50	355.6	507.9	80	349.7	510.4	110	353.9	507.9
22	311.8	461.6	52	356.2	504	82	349.9	510	112	353.4	507.9
24	348.9	520.4	54	358	502.3	84	350.3	508.1	114	349.8	507.8
26	346.6	510.6	56	359.4	508.9	86	355.4	508.4	116	353	509.5
28	348	509.6	58	360	507.3	88	360.7	509.3	118	353.8	508.9
30	363.2	513.2	60	360.2	507.7	90	360.9	507.3	120	354.3	511.1

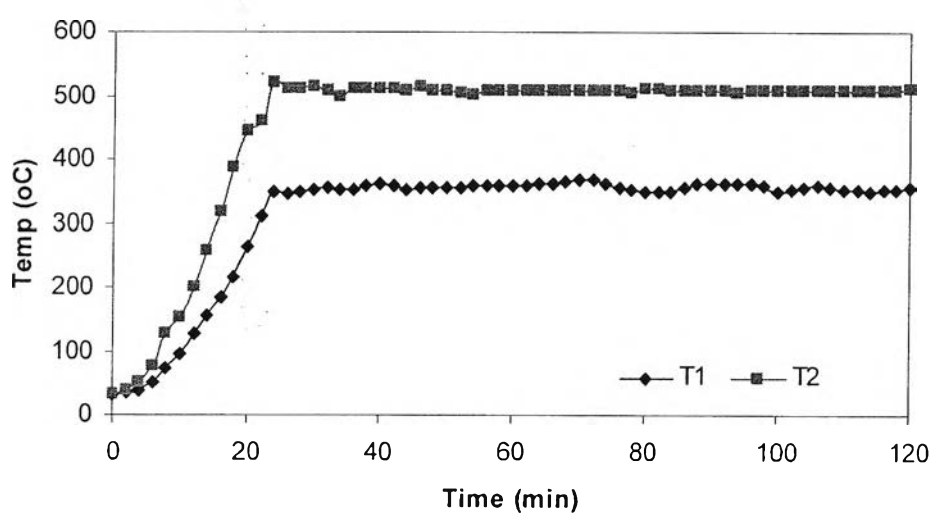


Figure A20 Operating temperatures vs. time on stream

Table A21 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	31.2	35.6	32	363.8	506.2	62	357.7	505.8	92	359.1	505.6
4	36.8	49.6	34	349.0	496.7	64	358.2	506.3	94	360.3	504.7
6	48.7	75.1	36	351.1	510.4	66	360.3	506.6	96	359.3	505.3
8	69.3	125.3	38	354.9	509.9	68	362.8	506.4	98	355.7	506.9
10	93.2	151.8	40	358.1	508.8	70	366.5	506.1	100	346.9	507.4
12	123.7	199.4	42	355.5	510.6	72	365.4	507.9	102	349.1	506.8
14	152.7	254.3	44	351.5	506.1	74	360.4	506	104	353	507.9
16	181.7	315.1	46	352.7	512.7	76	354.6	507.7	106	355	507.1
18	213.9	384.3	48	353.0	507.9	78	350.8	504.8	108	353	506.2
20	262.0	441.5	50	353.3	506.4	80	347.4	508.9	110	351.6	506.4
22	309.5	460.1	52	353.9	502.5	82	347.6	508.5	112	351.1	506.4
24	346.6	518.9	54	355.7	500.8	84	348	506.6	114	347.5	506.3
26	344.3	509.1	56	357.1	507.4	86	353.1	506.9	116	350.7	508
28	345.7	508.1	58	357.7	505.8	88	358.4	507.8	118	351.5	507.4
30	360.9	511.7	60	357.9	506.2	90	358.6	505.8	120	352	509.6

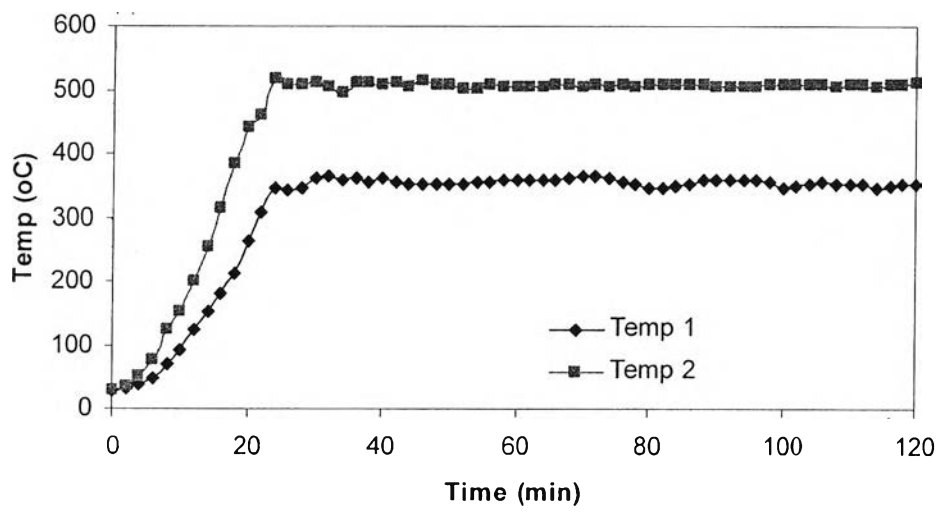


Figure A21 Operating temperatures vs. time on stream

Table A22 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.25

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	33.2	36.6	32	365.8	507.2	62	359.7	506.8	92	361.1	506.6
4	38.8	50.6	34	351	497.7	64	360.2	507.3	94	362.3	505.7
6	50.7	76.1	36	353.1	511.4	66	362.3	507.6	96	361.3	506.3
8	71.3	126.3	38	356.9	510.9	68	364.8	507.4	98	357.7	507.9
10	95.2	152.8	40	360.1	509.8	70	368.5	507.1	100	348.9	508.4
12	125.7	200.4	42	357.5	511.6	72	367.4	508.9	102	351.1	507.8
14	154.7	255.3	44	353.5	507.1	74	362.4	507	104	355	508.9
16	183.7	316.1	46	354.7	513.7	76	356.6	508.7	106	357	508.1
18	215.9	385.3	48	355	508.9	78	352.8	505.8	108	355	507.2
20	264	442.5	50	355.3	507.4	80	349.4	509.9	110	353.6	507.4
22	311.5	461.1	52	355.9	503.5	82	349.6	509.5	112	353.1	507.4
24	348.6	519.9	54	357.7	501.8	84	350	507.6	114	349.5	507.3
26	346.3	510.1	56	359.1	508.4	86	355.1	507.9	116	352.7	509
28	347.7	509.1	58	359.7	506.8	88	360.4	508.8	118	353.5	508.4
30	362.9	512.7	60	359.9	507.2	90	360.6	506.8	120	354	510.6

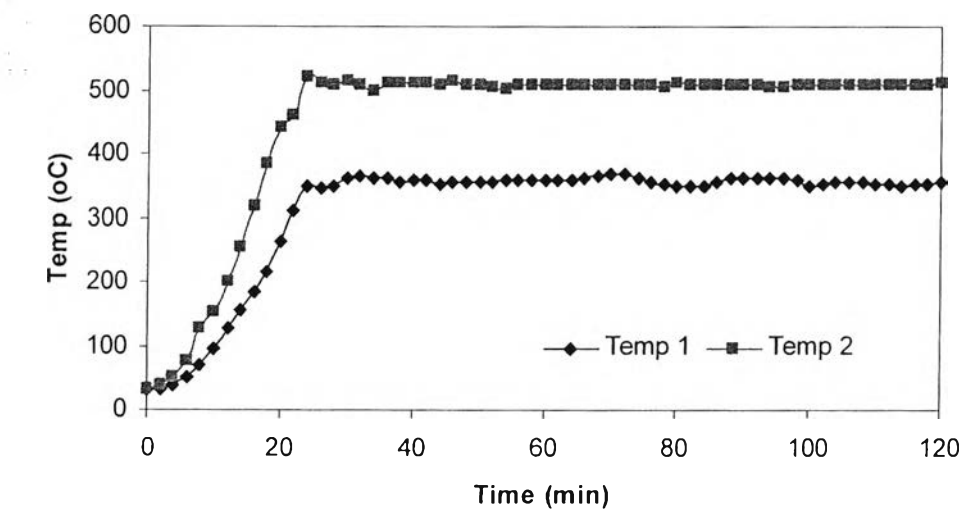


Figure A22 Operating temperatures vs. time on stream

Table A23 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.36

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	27.7	35.7	32	360.3	506.3	62	354.2	505.9	92	355.6	505.7
4	33.3	49.7	34	345.5	496.8	64	354.7	506.4	94	356.8	504.8
6	45.2	75.2	36	347.6	510.5	66	356.8	506.7	96	355.8	505.4
8	65.8	125.4	38	351.4	510	68	359.3	506.5	98	352.2	507
10	89.7	151.9	40	354.6	508.9	70	363	506.2	100	343.4	507.5
12	120.2	199.5	42	352	510.7	72	361.9	508	102	345.6	506.9
14	149.2	254.4	44	348	506.2	74	356.9	506.1	104	349.5	508
16	178.2	315.2	46	349.2	512.8	76	351.1	507.8	106	351.5	507.2
18	210.4	384.4	48	349.5	508	78	347.3	504.9	108	349.5	506.3
20	258.5	441.6	50	349.8	506.5	80	343.9	509	110	348.1	506.5
22	306	460.2	52	350.4	502.6	82	344.1	508.6	112	347.6	506.5
24	343.1	519	54	352.2	500.9	84	344.5	506.7	114	344	506.4
26	340.8	509.2	56	353.6	507.5	86	349.6	507	116	347.2	508.1
28	342.2	508.2	58	354.2	505.9	88	354.9	507.9	118	348	507.5
30	357.4	511.8	60	354.4	506.3	90	355.1	505.9	120	348.5	509.7

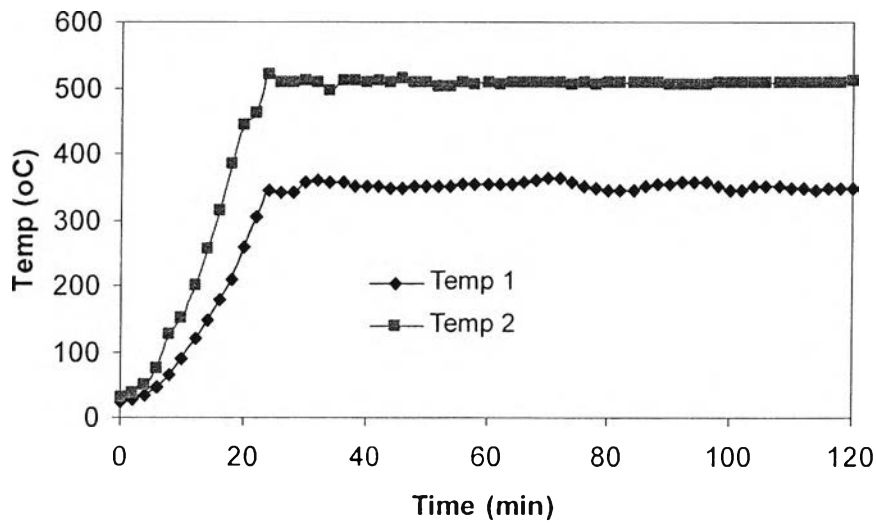


Figure A23 Operating temperatures vs. time on stream

Table A24 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.50

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	27.2	25	32	358.6	506.7	62	355.6	501.2	92	356.3	500.8
4	28.9	30.6	34	361.5	501.2	64	355.4	500.8	94	356.8	500.6
6	34.5	44.6	36	346.7	491.7	66	355.9	501.3	96	358	499.7
8	46.4	70.1	38	348.8	505.4	68	358	501.6	98	357	500.3
10	67	120.3	40	352.6	504.9	70	360.5	501.4	100	353.4	501.9
12	90.9	146.8	42	355.8	503.8	72	364.2	501.1	102	344.6	502.4
14	121.4	194.4	44	353.2	505.6	74	363.1	502.9	104	346.8	501.8
16	150.4	249.3	46	349.2	501.1	76	358.1	501	106	350.7	502.9
18	179.4	310.1	48	350.4	507.7	78	352.3	502.7	108	352.7	502.1
20	211.6	379.3	50	350.7	502.9	80	348.5	499.8	110	350.7	501.2
22	259.7	436.5	52	351	501.4	82	345.1	503.9	112	349.3	501.4
24	307.2	455.1	54	351.6	497.5	84	345.3	503.5	114	348.8	501.4
26	344.3	513.9	56	353.4	495.8	86	345.7	501.6	116	345.2	501.3
28	342	504.1	58	354.8	502.4	88	350.8	501.9	118	348.4	503
30	343.4	503.1	60	355.4	500.8	90	356.1	502.8	120	349.2	502.4

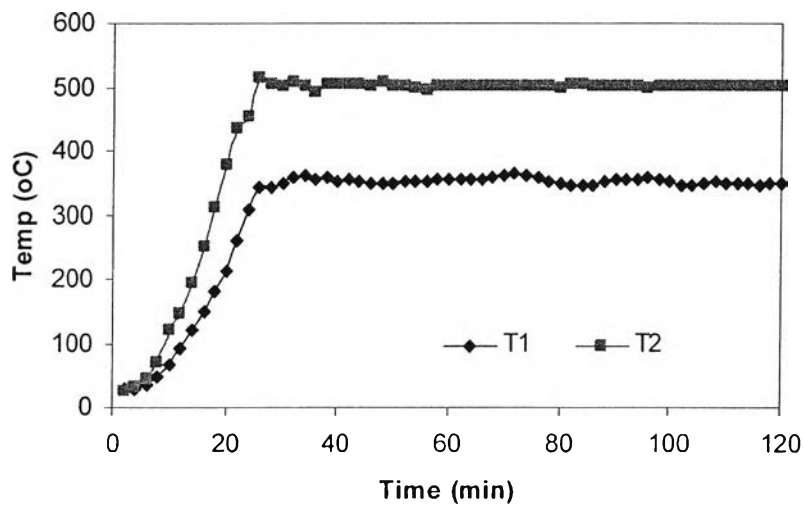


Figure A24 Operating temperatures vs. time on stream

Table A25 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.64

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	29.7	26.6	32	361.1	508.3	62	358.1	502.8	92	358.8	502.4
4	31.4	32.2	34	364	502.8	64	357.9	502.4	94	359.3	502.2
6	37	46.2	36	349.2	493.3	66	358.4	502.9	96	360.5	501.3
8	48.9	71.7	38	351.3	507	68	360.5	503.2	98	359.5	501.9
10	69.5	121.9	40	355.1	506.5	70	363	503	100	355.9	503.5
12	93.4	148.4	42	358.3	505.4	72	366.7	502.7	102	347.1	504
14	123.9	196	44	355.7	507.2	74	365.6	504.5	104	349.3	503.4
16	152.9	250.9	46	351.7	502.7	76	360.6	502.6	106	353.2	504.5
18	181.9	311.7	48	352.9	509.3	78	354.8	504.3	108	355.2	503.7
20	214.1	380.9	50	353.2	504.5	80	351	501.4	110	353.2	502.8
22	262.2	438.1	52	353.5	503	82	347.6	505.5	112	351.8	503
24	309.7	456.7	54	354.1	499.1	84	347.8	505.1	114	351.3	503
26	346.8	515.5	56	355.9	497.4	86	348.2	503.2	116	347.7	502.9
28	344.5	505.7	58	357.3	504	88	353.3	503.5	118	350.9	504.6
30	345.9	504.7	60	357.9	502.4	90	358.6	504.4	120	351.7	504

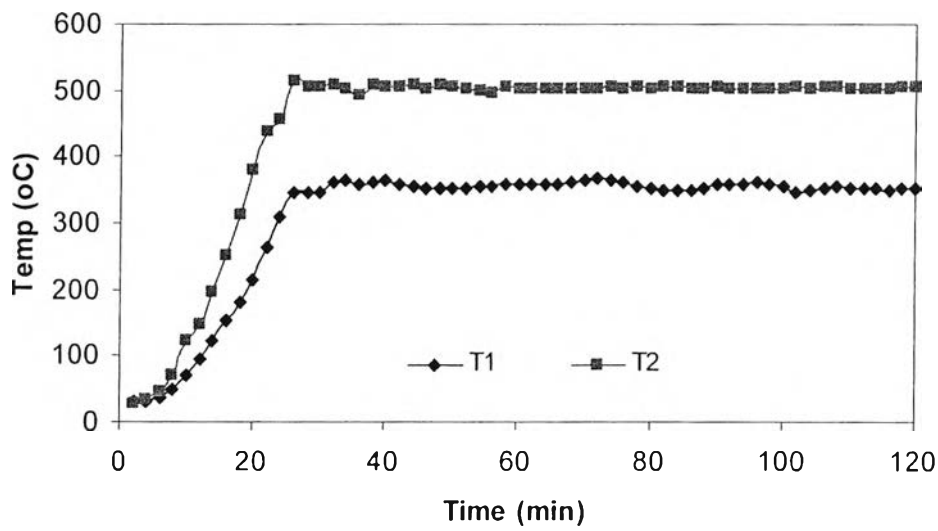


Figure A25 Operating temperatures vs. time on stream

Table A26 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.75

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	28.6	24.7	32	360	506.4	62	357	500.9	92	357.7	500.5
4	30.3	30.3	34	362.9	500.9	64	356.8	500.5	94	358.2	500.3
6	35.9	44.3	36	348.1	491.4	66	357.3	501	96	359.4	499.4
8	47.8	69.8	38	350.2	505.1	68	359.4	501.3	98	358.4	500
10	68.4	120	40	354	504.6	70	361.9	501.1	100	354.8	501.6
12	92.3	146.5	42	357.2	503.5	72	365.6	500.8	102	346	502.1
14	122.8	194.1	44	354.6	505.3	74	364.5	502.6	104	348.2	501.5
16	151.8	249	46	350.6	500.8	76	359.5	500.7	106	352.1	502.6
18	180.8	309.8	48	351.8	507.4	78	353.7	502.4	108	354.1	501.8
20	213	379	50	352.1	502.6	80	349.9	499.5	110	352.1	500.9
22	261.1	436.2	52	352.4	501.1	82	346.5	503.6	112	350.7	501.1
24	308.6	454.8	54	353	497.2	84	346.7	503.2	114	350.2	501.1
26	345.7	513.6	56	354.8	495.5	86	347.1	501.3	116	346.6	501
28	343.4	503.8	58	356.2	502.1	88	352.2	501.6	118	349.8	502.7
30	344.8	502.8	60	356.8	500.5	90	357.5	502.5	120	350.6	502.1

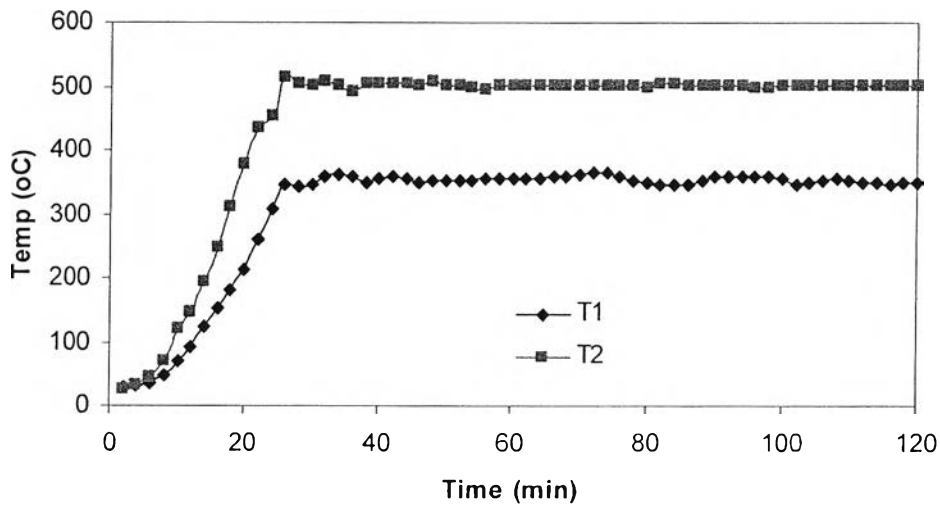


Figure A26 Operating temperatures vs. time on stream

Table A27 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 1.0

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2	Time (min)	T1	T2
2	29.9	27	32	361.3	508.7	62	358.3	503.2	92	359	502.8
4	31.6	32.6	34	364.2	503.2	64	358.1	502.8	94	359.5	502.6
6	37.2	46.6	36	349.4	493.7	66	358.6	503.3	96	360.7	501.7
8	49.1	72.1	38	351.5	507.4	68	360.7	503.6	98	359.7	502.3
10	69.7	122.3	40	355.3	506.9	70	363.2	503.4	100	356.1	503.9
12	93.6	148.8	42	358.5	505.8	72	366.9	503.1	102	347.3	504.4
14	124.1	196.4	44	355.9	507.6	74	365.8	504.9	104	349.5	503.8
16	153.1	251.3	46	351.9	503.1	76	360.8	503	106	353.4	504.9
18	182.1	312.1	48	353.1	509.7	78	355	504.7	108	355.4	504.1
20	214.3	381.3	50	353.4	504.9	80	351.2	501.8	110	353.4	503.2
22	262.4	438.5	52	353.7	503.4	82	347.8	505.9	112	352	503.4
24	309.9	457.1	54	354.3	499.5	84	348	505.5	114	351.5	503.4
26	347	515.9	56	356.1	497.8	86	348.4	503.6	116	347.9	503.3
28	344.7	506.1	58	357.5	504.4	88	353.5	503.9	118	351.1	505
30	346.1	505.1	60	358.1	502.8	90	358.8	504.8	120	351.9	504.4

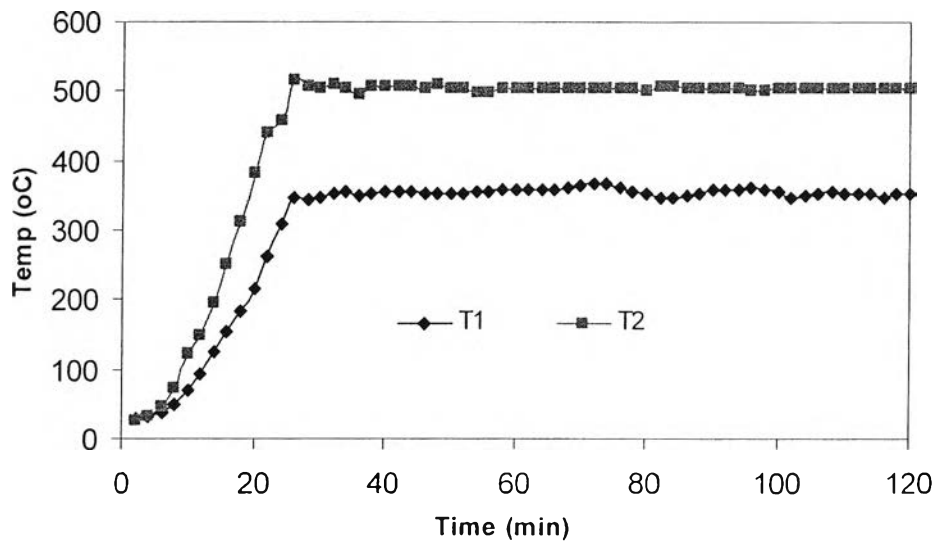


Figure A27 Operating temperatures vs. time on stream

B. YIELDS OF PYROLYSIS PRODUCTS

Table B1 Influences of Pyrolysis Temperatures

	T = 500°C	T = 600°C	T = 700°C
Gas	11.15	10.35	9.48
Liquid	41.80	42.53	43.38
Solid	47.05	47.12	47.14

Table B2 Influences of HBETA, HMOR and Noble Metals-supported Catalysts

	HBETA	HMOR	PtHMOR	PtBETA	ReHMOR	RuHMOR	RhHMOR
Gas	19.46	16.433	25.20	23.57	18.13	26.71	25.92
Liquid	31.40	34.667	27.13	29.43	35.89	25.04	27.35
Solid	49.14	48.900	47.67	47.00	45.97	48.24	46.74

Table B3 Influences of SBA-1 and Ru/SBA-1 Catalysts

	SBA-1	4.5Ru/SBA-1	4.0Ru/SBA-1	2.5Ru/SBA-1
Gas	12.63	15.40	20.03	21.33
Liquid	42.36	40.13	35.74	34.47
Solid	45.01	44.47	44.23	44.20

Table B4 Influences of MCM-41, Catalyst Temperatures and Ru/MCM-41

	MCM-41			1%Ru/MCM-41	1.5%Ru/MCM-41	2%Ru/MCM-41
	300°C	350°C	400°C			
Gas	14.56	23.52	13.52	26.34	29.33	32.08
Liquid	38.02	32.05	42.04	30.63	26.68	24.87
Solid	45.42	45.24	44.44	43.04	43.99	44.53

Table B5 Influences of RuNi/HMOR Bimetallic Catalysts

	α = 0	α = 0.25	α = 0.36	α = 0.50	α = 0.64	α = 0.75	α = 1
Gas	21.82	23.36	24.03	23.93	23.39	22.37	22.52
Liquid	30.21	29.15	28.03	28.26	28.53	29.83	29.68
Solid	47.97	47.48	47.94	47.81	48.09	47.80	47.80

C. CHEMICAL COMPOSITIONS OF MALTENES

Table C1 Influences of Pyrolysis Temperatures

	T = 500°C	T = 600°C	T = 700°C
Saturated HCs	53.81	44.13	46.87
Mono-aromatics	13.24	16.65	11.72
Di-aromatics	9.88	9.51	15.21
Poly-aromatics	8.99	8.19	10.97
Polar-aromatics	12.68	18.08	20.71

Table C2 Influences of HBETA, HMOR and Noble Metals-supported Catalysts

	HBETA	HMOR	Pt/HBETA	Ru/HMOR	Rh/HMOR	Re/HMOR	Pt/HMOR
Saturated HCs	58.31	60.19	62.8	64.02	61.07	54.37	62.14
Mono-aromatics	17.17	14.96	18.75	19.27	19.48	18.82	19.13
Di-aromatics	9.26	8.62	7.32	8.19	8.34	8.85	6.91
Poly-aromatics	6.54	5.07	5.92	3.97	4.32	6.98	4.7
Polar-aromatics	5.45	8.19	3.84	3.14	4.41	7.88	4.4

Table C3 Influences of SBA-1 and Ru/SBA-1 Catalysts

	SBA-1	4.5Ru/SBA-1	4.0Ru/SBA-1	2.5Ru/SBA-1
Saturated HCs	54.48	51.31	50.66	47.24
Mono-aromatic	12.69	14.98	15.21	20.27
Di-aromatic	9.70	14.12	13.89	17.54
Poly-aromatic	8.51	7.59	8.35	5.09
Polar-aromatic	12.39	10.12	10.81	7.12

Table C4 Influences of MCM-41, Catalyst Temperatures and Ru/MCM-41

	MCM-41			1%Ru/MCM-41	1.5%Ru/MCM-41	2%Ru/MCM-41
	350°C	400°C	450°C			
Saturated HCs	48.21	44.12	45.28	55.36	56.91	52.22
Mono-aromatic	17.18	16.49	11.11	18.47	21.23	24.68
Di-aromatic	20.37	24.89	23.71	11.64	12.10	17.1
Poly-aromatic	6.55	6.45	8.21	5.80	3.94	3.14
Polar-aromatic	7.69	8.05	11.69	8.73	5.82	2.86

Table C5 Influences of RuNi/HMOR Bimetallic Catalysts

	α = 0	α = 0.25	α = 0.36	α = 0.50	α = 0.64	α = 0.75	α = 1
Saturated HCs	46.09	60.05	68.06	61.26	60.23	53.57	56.22
Mono-aromatic	16.27	17.41	14.39	16.14	16.41	15.91	12.52
Di-aromatic	16.93	9.85	8.84	9.60	10.35	14.90	14.14
Poly-aromatic	8.04	7.33	5.81	6.59	6.31	7.32	7.96
Polar-aromatic	8.24	5.05	2.02	4.80	6.06	6.31	7.29

D. TRUE BOILING POINT OF MALTENES

Table D1 Influences of Pyrolysis Temperatures

% OFF	T = 500°C	T = 600°C	T = 700°C
0	23.5	23.7	21.8
5	144.1	155.8	154.6
10	147	167.7	167.9
15	167.7	173.3	180.6
20	171.9	191.1	204.9
25	185.7	204.1	213.3
30	197.3	214.1	227.5
35	210.3	224.6	234.4
40	221.3	234.9	246.8
45	226	247.7	256.5
50	248.8	261	270.8
55	268.2	273.5	285.4
60	282.4	286	297.8
65	298.3	299.7	311.8
70	315.9	315.9	327.5
75	331.6	332	345
80	350.2	352	365.5
85	370.7	374.2	389.9
90	393.9	399.4	416.2
95	422	427.2	447.5
100	488.2	489.8	518.1

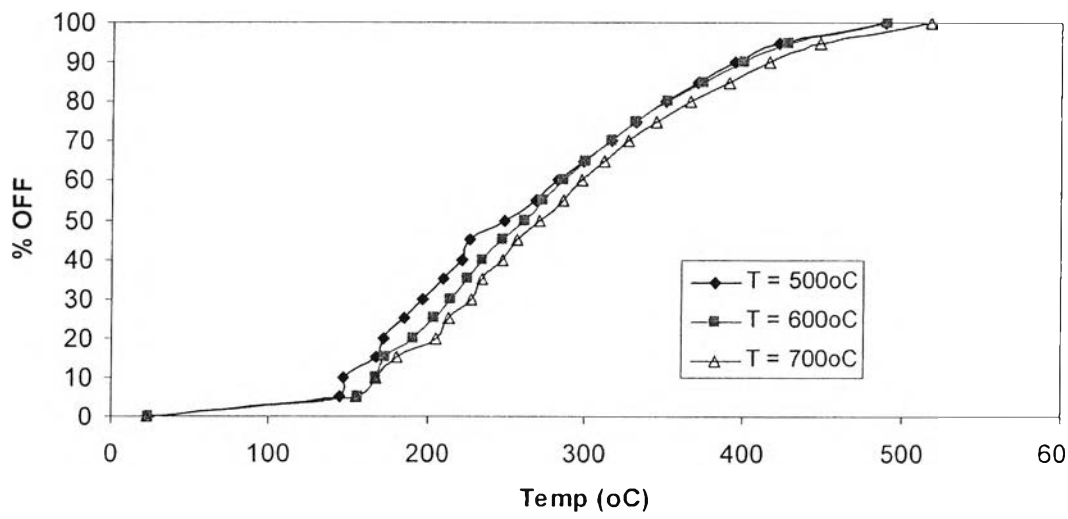


Figure D1 Influences of Pyrolysis on True Boiling Point Curves

Table D2 Influences of HBETA, HMOR and Noble Metals-supported Catalysts

% OFF	HBETA	HMOR	PtHMOR	PtBEA	ReHMOR	RuHMOR	RhHMOR
0	21.6	28.9	21.200	21.000	20.500	21.000	21.000
5	61.5	68.1	73.500	36.700	109.100	66.900	111.600
10	98.8	84.5	99.800	75.800	152.700	92.100	153.500
15	105.3	102.4	102.200	101.100	156.300	101.800	154.900
20	130.5	112.9	109.000	107.200	168.800	105.700	157.600
25	152.7	124.3	129.100	129.600	172.400	122.300	167.700
30	162.4	143.4	144.500	146.300	185.900	140.800	170.400
35	174.7	156.3	156.000	159.900	196.100	151.200	173.600
40	181.9	165.8	162.500	167.300	206.300	159.700	184.700
45	195.6	177.7	168.700	171.800	214.200	166.800	191.100
50	205.1	189.6	173.900	179.000	222.500	169.200	198.500
55	218.9	207.1	181.900	188.600	231.400	176.400	206.000
60	231.3	214.1	190.100	193.200	241.200	189.100	212.800
65	242.4	229.3	203.000	204.000	253.000	201.800	220.200
70	255.3	242.8	209.400	210.400	265.100	207.800	228.300
75	268.5	259.1	218.100	221.300	276.600	211.700	236.800
80	290.3	271.8	231.800	231.200	290.300	231.400	250.500
85	303.9	285.7	254.900	242.700	308.200	250.400	267.800
90	329.5	308.5	281.700	256.700	331.500	279.600	288.400
95	367.9	345.9	327.600	280.600	370.100	329.400	324.000
100	501.3	510.4	423.900	541.300	435.600	411.200	411.100

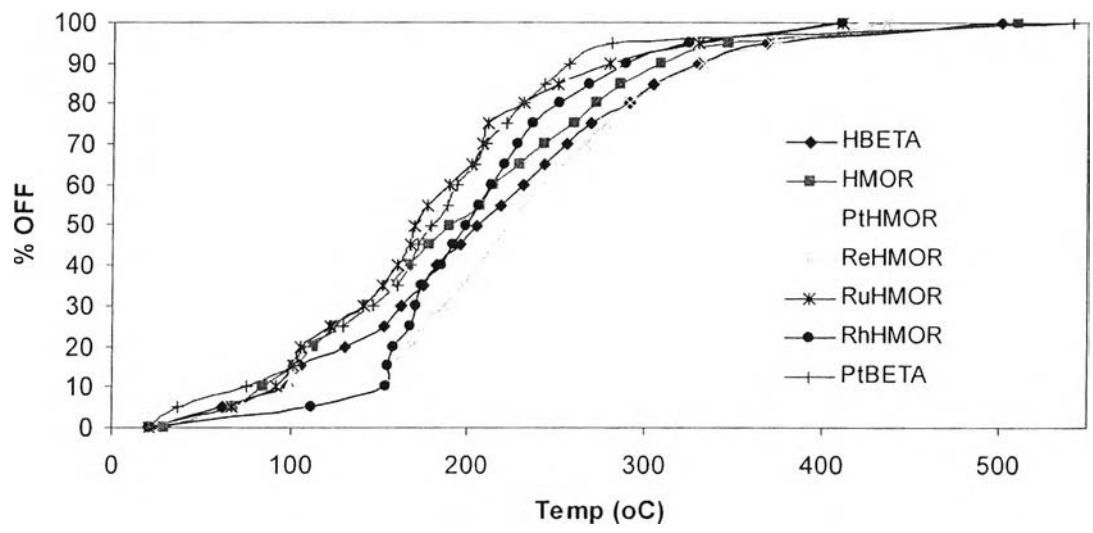


Figure D2 Influences of Pyrolysis on True Boiling Point Curves

Table D3 Influences of SBA-1 and Ru/SBA-1 Catalysts

% OFF	SBA-1	2.5Ru/SBA-1	4.0Ru/SBA-1	4.5Ru/SBA-1
0	20.8	20.8	20.5	20.8
5	108.1	147.8	110.1	135
10	153	154.5	154.6	149
15	161	167.2	167.7	164
20	168	170.4	171	169
25	174	179.7	182	173
30	186	184.8	187.2	184
35	198	191.2	194.8	199
40	213	201.3	204.3	209
45	221	207.3	212.3	229
50	241	213.3	220.3	246
55	258	220.4	228.5	264
60	275	227.2	236.5	280
65	289	235.2	247.9	291
70	311	245.2	257.3	318
75	325	255.5	269.3	329
80	346	268.4	279.9	347
85	365	280.7	292	362
90	399	297.9	307.4	394
95	417	325.5	329	413
100	456	584.3	585.9	446

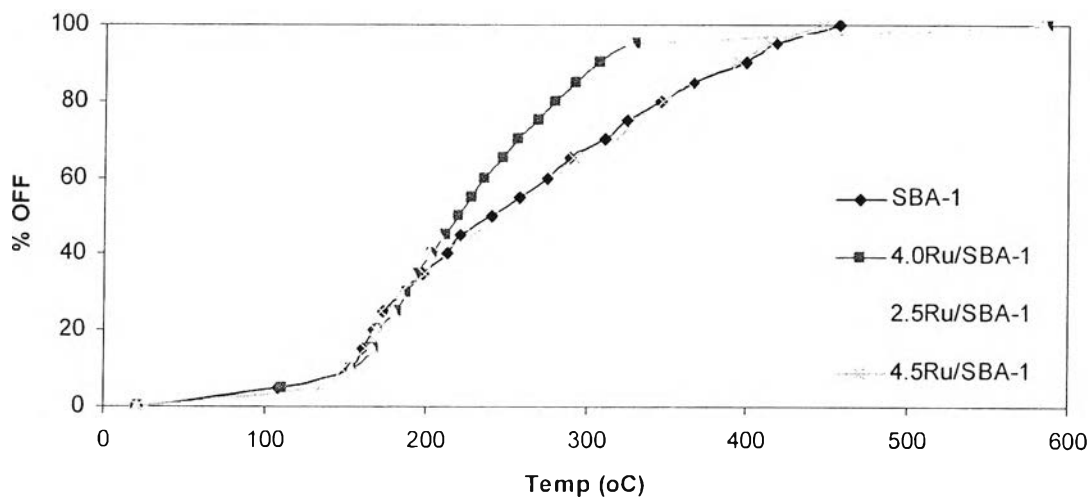


Figure D3 Influences of Pyrolysis on True Boiling Point Curves

Table D4 Influences of MCM-41, Catalyst Temperatures and Ru/MCM-41

%OFF	MCM-41	1%Ru/MCM-41	1.5%Ru/MCM-41	2%Ru/MCM-41
0	21.2	21.6	20.8	21
5	109.9	116.8	109.1	109.3
10	151.5	152.9	151.9	151.6
15	154	156.3	154.6	154.1
20	156.5	167.9	156.9	156.2
25	167	170.6	167.9	167.1
30	169.9	177	170.1	169.6
35	173.1	183.6	172.1	171.3
40	183.9	189.7	180.4	176
45	190.7	192.9	183.9	182.6
50	201	198.1	187.8	185.4
55	208.1	205.6	191.9	190.4
60	216.9	215.5	199.8	196.6
65	225.9	222.6	204	202.8
70	236.3	231.3	210.1	208.2
75	250.7	242.4	216.2	214.3
80	269.5	256.1	223	221.5
85	291.4	273.8	232.7	230.7
90	325	297.8	248	245.3
95	383.8	334.7	273.2	271.4
100	483	411.7	584.8	588.8

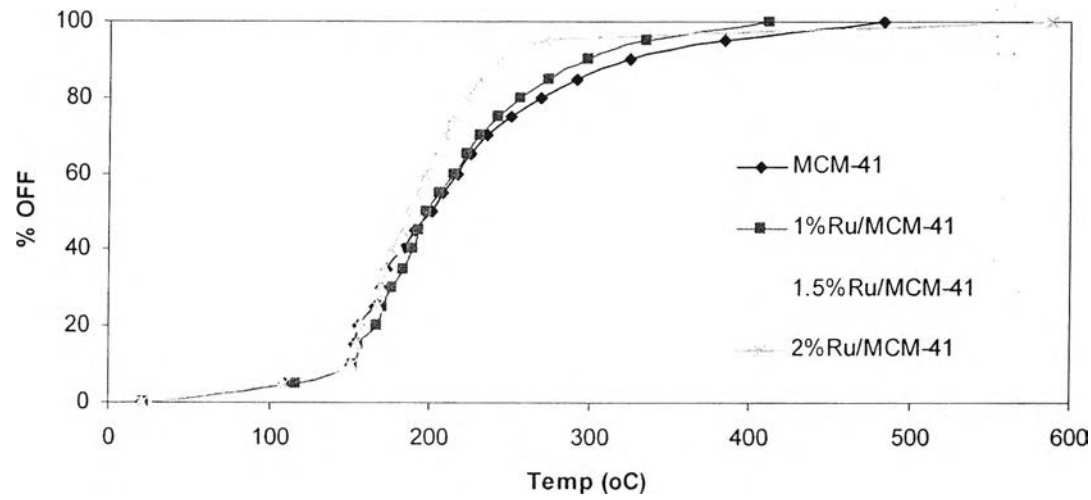


Figure D4 Influences of Pyrolysis on True Boiling Point Curves

Table D5 Influences of RuNi/HMOR Bimetallic Catalysts

% OFF	α = 0	α = 0.25	α = 0.36	α = 0.50	α = 0.64	α = 0.75	α = 1
0	21.2	21.6	67.9	21.2	21.4	25.6	25.8
5	86.5	110.3	106.9	109.1	148.1	70.4	111.6
10	155	150.5	108.8	117.3	155	72.5	151.4
15	156.4	152.7	115.7	152.3	166.7	75.4	154
20	161.8	154.9	149.5	154.5	171.3	144	157.9
25	170.3	157.5	151.3	157.7	184.4	155.5	168.5
30	173.7	167.2	153.3	167.8	193.3	167.5	171.5
35	185.4	169.8	156	170.5	206.4	170.5	181.8
40	192.1	172	160.7	175.9	215.3	177.6	189.3
45	201.4	181.4	168.1	184.9	225	184	195.9
50	207.6	186.6	170	191.2	235.6	189.9	203.9
55	214.1	192.8	172.5	200.3	249.2	196.8	211.4
60	221.6	203	183	206.5	263.1	203.1	217.9
65	228.9	211.3	189.8	213.1	275.1	210.3	225
70	237.7	220.4	200.6	220.8	288.5	217.2	233.1
75	250.6	231	210.6	229	303.1	224	244.7
80	266.3	246.8	222.1	240.1	321.3	234.6	259.2
85	284.3	269.6	238.9	256.9	341.5	250.6	276.3
90	310.5	292.4	267.7	279.1	369.1	272.9	300.8
95	354	330.9	304.6	317.6	405.4	309.2	346.2
100	453.3	440.2	415.6	433.8	477.1	417.7	464.2

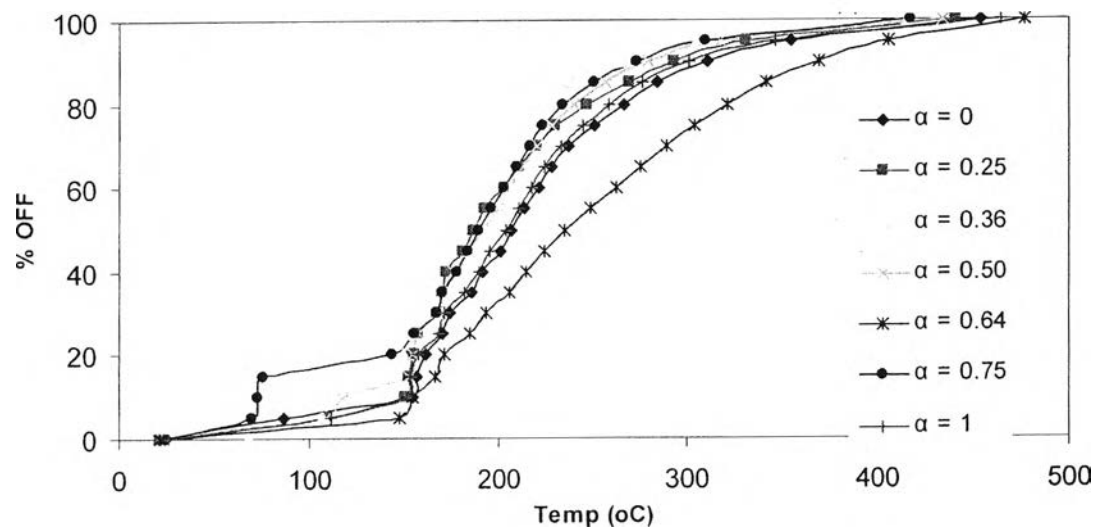


Figure D5 Influences of Pyrolysis on True Boiling Point Curves

F. TRUE BOILING POINT OF MALTENES, SATURES, MONO-, DI-, POLY- AND POLAR-AROMATICS IN TIRE-DERIVED OILS

Table F1 Pyrolysis conditions: Non-catalytic Pyrolysis

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

	Boiling point (°C)					
% OFF	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	23.5	22.9	22.2	22.2	22.2	20.5
5	144.1	156.7	86	70.1	73.2	21.6
10	147	170.3	213.3	80.1	73.6	22.7
15	167.7	178.6	253.7	252.4	74	23.7
20	171.9	189.9	267.6	294.2	74.4	24.8
25	185.7	200	274	306.7	74.8	25.8
30	197.3	208.3	282	315.3	75.1	26.9
35	210.3	214.8	288.8	321.9	75.5	28
40	221.3	222.3	295.2	329.3	76.6	30.5
45	226	229	302.3	336.6	168.3	38.8
50	248.8	236.8	308.4	346	320.3	172.7
55	268.2	246.5	317.1	354.4	350.4	187.6
60	282.4	256.8	326.3	364.1	366.4	257
65	298.3	268	333.6	374.3	379.6	323.6
70	315.9	279.2	344.7	385.5	392.4	363.9
75	331.6	292.8	359.5	398	404.8	399.7
80	350.2	312.4	375.2	409.3	416.6	411.3
85	370.7	337.8	394.2	422.9	431.1	422.2
90	393.9	375.1	414.3	440.6	449.5	447.2
95	422	414.8	442.6	466.7	476.2	482.3
100	488.2	487.1	509.2	521.5	526.4	522.7

Table F2 Pyrolysis conditions: Non-catalytic Pyrolysis

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 600°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	23.7	23.9	22.5	23.1	22.2	22.7
5	155.8	75.3	75.7	73.3	71	70
10	167.7	82.8	179.9	79.4	71.3	70.4
15	173.3	171.8	188.6	184.1	71.7	70.7
20	191.1	184.9	197	195.6	72.1	71.1
25	204.1	191.9	203.3	203	72.5	71.5
30	214.1	200.8	219.3	239.1	72.9	71.9
35	224.6	207.2	244.9	272	73.2	72.3
40	234.9	213.7	256	284.3	73.6	72.6
45	247.7	221.7	270.2	293.6	74.1	73
50	261	229.5	277.7	302.1	196.9	77.5
55	273.5	238.7	288.7	312.7	313.9	160.1
60	286	250.3	299.1	320.9	337.7	181.8
65	299.7	262.2	310.7	330.1	353	209.3
70	315.9	274.4	323.4	339.7	367	241.6
75	332	287.4	336.5	354.3	380.2	274.3
80	352	304.3	354.2	370.6	394	307.6
85	374.2	327.4	373.1	388.9	407.9	345.4
90	399.4	360.2	395.6	408.6	424.7	391.5
95	427.2	401.9	422.2	433.6	450.8	501.5
100	489.8	469.7	486.1	491.2	505.7	574.3

Table F3 Pyrolysis conditions: Non-catalytic Pyrolysis

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 700°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	True Boiling Point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.8	24.2	22.9	25.6	24.4	22
5	154.6	71.6	49.8	66.4	28	29.9
10	167.9	74.4	69.6	67.5	30.9	74
15	180.6	76.2	73.3	68.5	32	77.3
20	204.9	78.3	74.4	69.2	33.1	81.5
25	213.3	85	75.4	69.6	34.1	218.7
30	227.5	168.2	76.4	70	35.2	267.2
35	234.4	184.9	77.4	70.4	36.3	299.4
40	246.8	198.4	78.6	70.7	37.3	330.5
45	256.5	212.4	80.5	71.1	38.4	356.6
50	270.8	223.5	101.7	71.5	39.4	377.1
55	285.4	235.8	383	71.9	40.5	391.4
60	297.8	252.7	413.9	72.4	41.6	402.8
65	311.8	270.6	431	73.2	42.6	412.3
70	327.5	285.5	445.8	74.6	43.7	421.8
75	345	303.4	460.3	78	46.4	432.7
80	365.5	325.1	473.3	80.5	100.6	444.2
85	389.9	351.8	485.1	84.3	130.6	459.2
90	416.2	383.1	497	155.6	166.4	476.5
95	447.5	419.1	510.3	199.8	200	498.2
100	518.1	492.5	548.4	442.3	560	534.7

Table F4 Pyrolysis conditions: Catalytic Pyrolysis Using HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	28.9	40.1	26.9	27.5	22.2	20.5
5	68.1	123	32.6	32.6	33.9	21.6
10	84.5	155.6	34.6	33.7	35	22.7
15	102.4	165.7	35.6	34.8	41.6	29.9
20	112.9	171	36.7	35.8	42.6	44.3
25	124.3	176.6	37.7	36.9	43.7	48.4
30	143.4	185.6	38.8	38	44.7	154.5
35	156.3	191.4	39.9	39	45.8	178.9
40	165.8	197.6	40.9	40.1	46.9	194.1
45	177.7	205.8	42	41.1	47.9	212.5
50	189.6	212	43.1	42.2	49	228.3
55	207.1	220.5	45.2	43.3	50.1	243.8
60	214.1	228.8	67	44.3	51.1	259.7
65	229.3	237.6	170.7	45.4	52.2	274.5
70	242.8	245.1	259.7	46.4	53.2	289.8
75	259.1	254.5	277.2	58.6	54.3	306.1
80	271.8	263	283	104.8	55.4	328.5
85	285.7	274.3	294.2	154.8	56.4	356.5
90	308.5	289.3	304.2	195.8	90.8	378.2
95	345.9	311.4	319.7	309.2	216.2	492
100	510.4	517.1	531.8	394.6	529.7	573.4

Table F5 Pyrolysis conditions: Catalytic Pyrolysis Using Ru/HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.000	23.1	23.5	22.7	22.3	23.5
5	66.900	74.3	73.9	36.5	60.9	179.5
10	92.100	79.2	77.6	52	61.9	195.4
15	101.800	155.5	82.1	67.2	63	208.6
20	105.700	168.7	253.3	98.1	64.1	217.5
25	122.300	175.4	272.7	172.9	65.1	230
30	140.800	188.8	281.6	222.5	66.2	242.5
35	151.200	198.6	289.4	251.2	67.3	255.1
40	159.700	207.7	294.5	264	116.8	267.4
45	166.800	214.8	301.8	273.9	143.6	278.9
50	169.200	222.7	306.5	278	161.5	290.8
55	176.400	230.3	312.7	284.5	170.4	303.9
60	189.100	238.6	317.7	290.3	177.7	317.8
65	201.800	248.1	323.7	298.5	181	330.9
70	207.800	258.6	329.6	303.2	185.5	345.5
75	211.700	270.3	335.1	307.8	192.7	362.2
80	231.400	281.1	343.7	314.3	204.5	377.6
85	250.400	295.5	354.5	321.8	221.2	386.7
90	279.600	318.4	368.8	333.6	243.6	408.3
95	329.400	362.9	392.4	374	336.1	441.9
100	411.200	482.9	472.5	459.5	452.7	511.5

Table F6 Pyrolysis conditions: Catalytic Pyrolysis Using Pt/HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.2	23.1	23.9	21.4	22.5	26.1
5	73.5	74.6	173.7	52.4	72.3	176.3
10	99.8	80.6	200.7	69.1	72.6	193.7
15	102.2	158.3	211.7	69.9	73	199.7
20	109.0	171.3	219.2	70.7	73.4	209.2
25	129.1	184.4	226.7	71.5	73.8	220.7
30	144.5	191.8	231	72.6	74.2	233.8
35	156.0	201.7	235.9	74.3	74.5	246
40	162.5	208	244.3	79.1	74.9	260.2
45	168.7	213.8	247.3	231.8	77.3	272.9
50	173.9	220.7	254.2	258.9	270.8	285.3
55	181.9	226.7	260.1	271.6	291	298.9
60	190.1	233.4	265.7	280.1	301.9	314.1
65	203.0	241.5	272.6	291.2	310.7	328.4
70	209.4	251.2	277.8	301.5	320.3	344.5
75	218.1	261.2	285.8	311.5	332.3	362.4
80	231.8	272.8	293.6	323.7	346.5	379.5
85	254.9	286.2	305.6	335.2	362.8	386.9
90	281.7	306.6	324.9	355.2	384.8	412.4
95	327.6	344.9	357.3	388.2	415.5	446.6
100	423.9	447.1	447.1	468.3	491.4	509.4

Table F7 Pyrolysis conditions: Catalytic Pyrolysis Using Rh/HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenea	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.0	23.1	23.2	23.1	23.3	25.8
5	111.6	77.6	226.2	157.1	71.9	185.2
10	153.5	169	236.1	182.5	72.3	201.5
15	154.9	184.1	246.7	205.4	72.7	215.4
20	157.6	192.5	254.2	253.4	73.1	232.6
25	167.7	203.4	260.4	275	73.5	247.7
30	170.4	210.2	266.4	284.8	73.9	262.6
35	173.6	215.2	272.3	291.7	75.1	275.6
40	184.7	222.1	275.2	294.3	159.8	287
45	191.1	228	279.7	301.5	191.1	298.5
50	198.5	234.3	285.2	304.8	231.8	310.6
55	206.0	242	289.9	309.3	295.6	321.5
60	212.8	250	293.8	315.7	317.2	334.1
65	220.2	258.7	300.5	318.9	330	346.7
70	228.3	268.1	306	324.9	342.5	361.7
75	236.8	277.4	314.1	331.3	353	376.1
80	250.5	288.7	322.4	339.4	364.2	385.9
85	267.8	302.2	332.4	351.2	376.3	402.3
90	288.4	326	347	367.7	392.4	425.9
95	324.0	371.4	375.2	397.6	417.7	460.2
100	411.1	499.5	461.2	473.8	486.2	529.5

Table F8 Pyrolysis conditions: Catalytic Pyrolysis Using Re/HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	20.5	23.9	22.9	23.1	30.3	22.2
5	109.1	75.8	173.7	155.5	71.4	169.7
10	152.7	80.5	215.3	158.7	71.9	191.7
15	156.3	156.3	249.5	169.9	72.6	202.2
20	168.8	168.1	266.2	171.1	73.4	213
25	172.4	171.7	272.9	173.3	74.7	226
30	185.9	183.3	276.9	183.1	154.4	237.3
35	196.1	190.6	285.5	186.4	157.3	249.9
40	206.3	195.1	290.5	191.3	168.5	263
45	214.2	204.1	296.4	193.8	171.2	275.3
50	222.5	211.3	302.2	201.6	180.2	286.2
55	231.4	214.7	307.4	206	189.7	298.3
60	241.2	222.1	314.5	212.4	195.1	311.3
65	253.0	229.1	319.8	217.5	210.2	323.4
70	265.1	236	326.1	224.9	222.5	337.8
75	276.6	246.7	332.1	236.6	242.7	353.2
80	290.3	260.1	340.5	264.7	285.3	370.8
85	308.2	275.7	352.8	323.7	328.8	387.3
90	331.5	296.1	370	356.2	369.6	414.4
95	370.1	339.7	400.4	393.6	398	451.5
100	435.6	471.1	484.6	477.5	495.2	521.1

Table F9 Pyrolysis conditions: Catalytic Pyrolysis Using MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.2	24.4	23.7	23.1	23.8	21.4
5	109.9	74.1	81.8	51.8	25.5	24.4
10	151.5	76.4	245.1	70.5	27.8	29.7
15	154	79	255	71.7	31.2	133.8
20	156.5	103.6	267.9	72.3	71.9	177.9
25	167	169.9	273.3	72.9	76.5	207.4
30	169.9	183	278.3	73.5	223.7	234.9
35	173.1	192.8	287.3	74.5	280.5	256.7
40	183.9	205.3	293.5	75.6	309.9	278.9
45	190.7	213.9	302	76.9	328	298.8
50	201	222.8	309.3	79	340.7	321
55	208.1	231.9	318.9	94.7	354.2	341.3
60	216.9	242.9	328.1	302.5	367.3	361
65	225.9	255.6	335.6	317.6	380.4	381
70	236.3	270.2	347.4	330.8	393.8	392.9
75	250.7	283.6	361.9	347.7	407.3	407.4
80	269.5	300.1	375.2	364.3	420	421.5
85	291.4	324.9	391.8	383.1	435.3	441.3
90	325	359.6	410.7	405.3	453	464.1
95	383.8	403.8	435.4	433.1	478.1	492.6
100	483	472.5	491.6	494.5	520.8	531

Table F10 Pyrolysis conditions: Catalytic Pyrolysis Using HMOR

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 400°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.4	23.1	23.5	21.6	22	21.4
5	115.3	79.8	210.6	24.8	72.9	23.1
10	156	167.9	226.5	30.5	74.4	25.8
15	161.4	172.8	229.8	74.7	75.1	29.2
20	170.7	186	234.9	76.8	157.9	74.4
25	180.6	192.9	244.3	115.9	191.5	181.2
30	190.1	203	246.1	171.7	212	221.8
35	199.9	208.2	250.8	183.8	238.8	238.2
40	207.7	214.1	255	195.2	269.5	252.5
45	214.5	220.1	260.3	207.8	276.2	266.3
50	222	224.5	264.6	230.3	287.3	279.5
55	228.5	230.9	269.4	257.4	293.4	292.4
60	235.5	236.9	272.9	272.2	301.2	307.4
65	244.1	243.9	276.6	281	308.5	323.9
70	253.1	252.4	282.3	292.9	316.1	340.8
75	262.5	260.8	288	306.5	325.2	359.3
80	272.9	270.8	293.5	323.3	338	379.1
85	284.4	280.9	304	342.6	353.3	398.8
90	300.8	294.9	319.6	367.4	376.5	417.1
95	335.2	321.4	343.8	408.3	412.8	447.1
100	446.4	422.1	439.3	472.5	487.9	497.5

Table F11 Pyrolysis conditions: Catalytic Pyrolysis Using MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 450°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	22.5	22.9	23.1	22.9	21.6	21.4
5	154.6	158.7	213.9	272.5	33.5	23.5
10	158.4	172.6	235.5	287.1	314.0	26.7
15	170.2	185	250.4	292.7	328.2	32
20	173.7	191.3	255.2	296.8	340.1	75.3
25	185.1	195.6	265.6	304.2	348.3	178.2
30	191.7	203.4	272.9	308.4	355.3	209.1
35	197.9	208.2	276.6	314.2	362.6	239.9
40	205	213.2	284.3	319.2	369.4	262
45	212.3	218.7	291.1	325.0	376.1	282.5
50	218.4	223.8	299	331.6	383.0	302.2
55	225.4	230.5	306.7	338.5	390.2	323.5
60	233	235.9	316.5	347.6	397.9	344.5
65	243.1	244.7	326.9	357.4	405.4	367.5
70	254.6	253.9	336.8	368.5	412.9	386.7
75	268.5	265.2	350.4	381.2	422.1	393.3
80	283.1	277.6	367.2	396.3	433.4	416.8
85	301.2	292.9	384.9	411.6	447.4	442.3
90	327.9	316.5	408.6	433.3	465.5	471.2
95	371.6	358.9	441.4	465.7	491	504.5
100	474.6	466.6	509.9	525.7	532.6	563.5

Table F12 Pyrolysis conditions: Catalytic Pyrolysis Using 1%Ru/MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.6	22.2	21.8	21.6	21.2	21.4
5	116.8	168.4	74.4	25.6	22.9	23.5
10	152.9	177.3	214.9	71.5	25.0	26.7
15	156.3	185.3	231.6	182.6	27.8	32
20	167.9	191.8	234.5	256.3	34.6	75.3
25	170.6	197.7	244.7	271.1	73.9	178.2
30	177	203.8	249.8	276.5	175.9	209.1
35	183.6	209.6	254.8	278.2	229.0	239.9
40	189.7	214.2	262.1	285.0	292.1	262
45	192.9	220.2	268.3	291.8	320.9	282.5
50	198.1	225.1	273.7	294.8	335.6	302.2
55	205.6	232.5	279.8	301.1	350.5	323.5
60	215.5	240.0	287.1	308.9	366.1	344.5
65	222.6	249.9	293.1	319.1	381.4	357.5
70	231.3	260.1	302.1	329.7	393.7	386.7
75	242.4	271.6	311.9	341.1	409.3	393.3
80	256.1	283.2	323.6	356.8	426.7	416.8
85	273.8	298.3	337.5	377.9	449.4	442.3
90	297.8	321.0	360.8	406.9	474.1	471.2
95	334.7	364.5	402.7	451.4	502.8	504.5
100	411.7	518.8	524.3	526.1	561	563.5

Table F13 Pyrolysis conditions: Catalytic Pyrolysis Using 1.5%Ru/MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	20.8	22.5	22	21.6	21.6	21.4
5	109.1	78.4	72.1	26.3	23.9	23.5
10	151.9	169	231.8	74.8	27.8	26.7
15	154.6	173.4	237.6	270.5	74.2	32.6
20	156.9	185.6	248.7	276.6	241.7	75.8
25	167.9	192.2	253.4	285.0	293.0	212
30	170.1	198.9	256.8	290.6	311.8	243.5
35	172.1	205.5	264.8	294.6	322.2	264.9
40	180.4	211.9	269.9	300.2	330.3	284.9
45	183.9	214.7	274.6	305.4	339.4	306.1
50	187.8	221.2	280.5	310.3	347.7	324.1
55	191.9	227.0	287.5	316.4	356.2	342.4
60	199.8	232.2	292.6	322.0	365.6	360.3
65	204	236.9	300.3	329.3	375.9	378.9
70	210.1	245.5	307.5	335.6	386.8	387.0
75	216.2	253.7	317.0	345.0	395.7	389
80	223	265.2	327.9	356.8	409.7	405
85	232.7	278.9	340.7	372.7	425.5	425.2
90	248	299.0	360.4	394.7	446	446.4
95	273.2	336.7	393.3	427.4	473.2	475.3
100	584.8	448.5	477.6	491.5	510.4	514.1

Table F14 Pyrolysis conditions: Catalytic Pyrolysis Using 2%Ru/MCM-41

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21	22.9	23.3	23.1	23.9	21
5	109.3	76.7	79.5	154.8	72.6	22
10	151.6	104.9	155.6	156.2	73.1	23.1
15	154.1	156.6	159.1	158.9	73.6	24.2
20	156.2	167.9	170.5	168.8	74.5	25.2
25	167.1	171	181.4	171.1	85.0	26.3
30	169.6	179.7	193.2	176.9	156.2	27.3
35	171.3	186.4	210.7	186.2	166.5	28.4
40	176	192.9	212.8	194.9	173.9	29.5
45	182.6	201.7	217.5	211.8	199.8	30.5
50	185.4	207.7	228.2	232.3	247.4	31.6
55	190.4	213.7	231.5	246.3	270.2	32.6
60	196.6	220.2	232.7	254.0	284.2	176.2
65	202.8	226.1	235.7	264.7	293.5	227.3
70	208.2	233.7	245.1	273.3	304.4	260.0
75	214.3	242.5	250.4	284.4	314.0	289.5
80	221.5	254.4	260.2	294.2	324.4	314.9
85	230.7	270.0	273.5	308.7	336.3	345.9
90	245.3	289.4	290.9	328.5	354.4	378.1
95	271.4	328.8	327.4	360.1	386.6	417.4
100	588.8	442.6	431.2	452.7	472.5	497.6

Table F15 Pyrolysis conditions: Catalytic Pyrolysis Using SBA-1

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	20.8	22.5	23.1	23.1	23.1	21
5	108.1	74.1	77	80.9	75.1	22
10	153	80.6	153.6	155.5	156.1	23.9
15	161	154.1	156.6	157.9	167.2	73.8
20	168	156.2	165.6	167.7	172.4	200.5
25	174	160	170.6	170.2	188.3	227.6
30	186	169.7	176.7	172.1	203.7	253.2
35	198	171.2	186.7	178.1	230.2	278.3
40	213	173.8	194.4	184.3	255.9	296
45	221	184.1	210.7	189.0	271.6	312.4
50	241	186.8	213	193.8	281.7	326.1
55	258	192.1	226.2	202.5	292.3	339.9
60	275	196.9	231.6	213.6	302.4	352.8
65	289	203.9	234.8	232.9	311.5	365.7
70	311	211.5	246.6	255.2	322.8	378.3
75	325	217.8	255.7	273.5	334.7	389.5
80	346	227.7	272.3	294.0	349.8	404.5
85	365	244.5	287.8	317.4	368.2	418.2
90	399	273.8	315.7	342.6	391.7	438.9
95	417	323.3	360.0	382.6	420.5	467.7
100	456	444.7	456.6	465.3	484.9	516.6

Table F16 Pyrolysis conditions: Catalytic Pyrolysis Using 2.5Ru/SBA-1

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	20.8	22.2	22.7	22.7	22.5	20.8
5	147.8	71.5	153.7	109.3	69.1	24.4
10	154.5	74.9	169.8	156.6	69.4	36.3
15	167.2	78	187.4	170.4	69.8	171.3
20	170.4	153.1	193.7	184.6	70.2	201
25	179.7	157	210.9	204.4	70.6	223.3
30	184.8	169.7	211.9	227.5	71.0	243.5
35	191.2	172.3	212.9	236.6	71.3	263.2
40	201.3	184.5	215.4	246.7	71.7	280.8
45	207.3	191	227.9	254.2	72.1	295.9
50	213.3	198.1	230.9	264.2	72.5	314.7
55	220.4	205.8	232.1	272.2	72.9	332.5
60	227.2	213.3	234	276.8	73.2	350.8
65	235.2	220.8	243.6	285.9	76.7	371.9
70	245.2	227.7	248.3	292.6	201.2	389.8
75	255.5	237.2	254.5	302.7	288.5	405.1
80	268.4	249.7	264.7	314.1	310.0	416.9
85	280.7	265.6	277.9	327.0	332.1	433.4
90	297.9	285.5	295.8	343.3	358.4	453.3
95	325.5	322.6	331.7	373.5	392.7	480.9
100	584.3	433.3	440.0	459.0	475.2	532.7

Table F17 Pyrolysis conditions: Catalytic Pyrolysis Using 4.0Ru/SBA-1

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	True Boiling Point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	20.5	26.7	25.4	25	30.3	20.3
5	110.1	33.1	31.4	30.1	37.7	42.8
10	154.6	34.3	32.9	31.8	40.9	49.6
15	167.7	37.7	33.9	32.9	42	76.7
20	171	48.8	35	33.9	43.1	104
25	182	101.2	36	35	44.1	130.4
30	187.2	115.4	37.3	36	45.2	156.1
35	194.8	135.3	42	37.1	46.2	167.1
40	204.3	153.6	46	38.2	47.3	175.1
45	212.3	161.1	106.9	39.2	48.4	177.5
50	220.3	167.7	160	40.3	49.4	183
55	228.5	171.3	173.6	41.4	50.5	192
60	236.5	175.6	189.1	42.4	51.5	204.6
65	247.9	183.6	192.2	43.5	52.6	215
70	257.3	189.6	204.3	44.5	53.7	229.3
75	269.3	195.9	207.6	45.6	54.7	252.4
80	279.9	203.3	212.2	79	55.8	283.2
85	292	212.1	221.2	149.7	56.9	318.8
90	307.4	224.1	227.9	190.7	62.4	380.5
95	329	244.9	247.1	227.7	103.7	543.7
100	585.9	381.9	345.4	371.7	500.2	578.3

Table F18 Pyrolysis conditions: Catalytic Pyrolysis Using 4.5Ru/SBA-1

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	20.8	30.3	25	24.8	35.4	21.8
5	135	35.8	29.9	28.8	40.3	34.1
10	149	74.4	31.6	31.2	41.4	41.4
15	164	107	32.6	32.2	42.4	42.8
20	169	132.9	33.7	33.3	43.5	45.4
25	173	153.3	34.8	34.3	44.5	50.7
30	184	161.4	35.8	35.4	45.6	79.5
35	199	167.9	36.9	36.5	46.7	127
40	209	171.4	38	37.5	47.7	147.4
45	229	174.3	39	38.6	48.8	165.3
50	246	182.7	40.1	39.7	49.8	176.6
55	264	189	41.1	40.7	50.9	177.7
60	280	192.2	42.2	41.8	52	182.9
65	291	198.9	43.3	42.8	53	191.9
70	318	206	44.3	43.9	54.1	206.7
75	329	210.9	45.4	45	55.2	220
80	347	219.3	46.4	46	56.2	256.6
85	362	227.6	92.3	47.1	57.33	316.9
90	394	238.9	116.8	48.1	58.3	528.1
95	413	258.5	163.6	107.4	59.4	554.6
100	446	541.9	527.8	530.7	305.4	579.5

Table F19 Pyrolysis conditions: Catalytic Pyrolysis Using HBETA

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.6	28.8	25.8	25.8	36	29.2
5	61.5	35	30.5	31.2	42.2	42.8
10	98.8	38.2	32.2	33.1	43.3	45.8
15	105.3	47.1	33.3	34.3	44.3	48.8
20	130.5	106.7	34.6	35.4	45.4	63.6
25	152.7	134.4	35.7	36.5	46.4	90.8
30	162.4	154.7	36.5	37.5	47.5	144.5
35	174.7	162.4	37.5	38.6	48.6	161.9
40	181.9	168.9	38.6	39.7	49.6	177.8
45	195.6	172.2	39.7	40.7	50.7	183.8
50	205.1	179.2	40.7	41.8	51.8	199.1
55	218.9	186.5	41.8	42.8	52.8	216.1
60	231.3	191.5	42.8	43.9	53.9	243.7
65	242.4	197.4	43.9	45	54.9	275.7
70	255.3	205.8	45	46	56	305.3
75	268.5	211.8	46	47.1	57.1	343.8
80	290.3	222.1	47.1	48.1	58.1	436.7
85	303.9	233.9	49.4	52.8	59.2	523.5
90	329.5	250.9	156.9	149.7	60.3	542.9
95	367.9	285.7	194.9	191.2	75.3	561.9
100	501.3	534.5	552.2	552.2	497.7	580.3

Table F20 Pyrolysis conditions: Catalytic Pyrolysis Using Pt/HBETA

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.0	28.6	26.3	23.7	33.9	28.4
5	36.7	34.6	31.6	28.6	40.1	29.5
10	75.8	38	32.9	32	41.1	40.1
15	101.1	46	33.9	33.3	42.2	43.5
20	107.2	102.4	35	34.3	43.3	45.2
25	129.6	117.2	36	35.4	44.3	46.4
30	146.3	139.1	37.1	36.5	45.4	47.9
35	159.9	155.2	38.2	37.5	46.4	50.3
40	167.3	162.5	39.2	38.6	47.5	58.3
45	171.8	169	40.3	39.7	48.6	78.6
50	179.0	172.3	41.4	40.7	49.6	86
55	188.6	179.8	42.4	41.8	50.7	131.6
60	193.2	188.4	43.5	42.8	51.8	165.8
65	204.0	192.2	44.5	43.9	52.8	183.2
70	210.4	199.9	45.6	45	53.9	355.1
75	221.3	207.9	46.7	46	54.9	517.7
80	231.2	214.8	47.7	47.1	56	534.8
85	242.7	225.8	90.3	48.1	57.1	547
90	256.7	239.1	149.6	64.1	58.1	558.6
95	280.6	260.8	188.6	160.5	72.6	570.3
100	541.3	532	558.5	374.1	216	581.2

Table F21 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.2	30.3	25	24.8	35.4	21.8
5	86.5	35.8	29.9	28.8	40.3	34.1
10	155	74.4	31.6	31.2	41.4	41.4
15	156.4	107	32.6	32.2	42.4	42.8
20	161.8	132.9	33.7	33.3	43.5	45.4
25	170.3	153.3	34.8	34.3	44.5	50.7
30	173.7	161.4	35.8	35.4	45.6	79.5
35	185.4	167.9	36.9	36.5	46.7	127
40	192.1	171.4	38	37.5	47.7	147.4
45	201.4	174.3	39	38.6	48.8	165.3
50	207.6	182.7	40.1	39.7	49.8	176.6
55	214.1	189	41.1	40.7	50.9	177.7
60	221.6	192.2	42.2	41.8	52	182.9
65	228.9	198.9	43.3	42.8	53	191.9
70	237.7	206	44.3	43.9	54.1	206.7
75	250.6	210.9	45.4	45	55.2	220
80	266.3	219.3	46.4	46	56.2	256.6
85	284.3	227.6	92.3	47.1	57.33	316.9
90	310.5	238.9	116.8	48.1	58.3	528.1
95	354	258.5	163.6	107.4	59.4	554.6
100	453.3	541.9	527.8	530.7	305.4	579.5

Table F22 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.25

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.6	25.8	25.4	25.4	30.7	21.2
5	110.3	32	31.2	30.9	39.4	42
10	150.5	33.3	32.6	32.4	40.9	47.3
15	152.7	34.3	33.7	33.5	42	70.3
20	154.9	36	34.8	34.6	43.1	122.5
25	157.5	38.6	35.8	35.6	44.1	145.1
30	167.2	46.7	36.9	36.7	45.2	164.4
35	169.8	102.7	40.9	37.7	46.2	174.7
40	172	131.5	43.5	38.8	47.3	177.3
45	181.4	154.7	101.1	39.9	48.4	181.9
50	186.6	164.8	153.5	40.9	49.4	191.9
55	192.8	171.4	184.9	42	50.5	206.2
60	203	179.1	207.7	43.1	51.5	217.9
65	211.3	189.3	221.4	44.1	52.6	236.2
70	220.4	195.8	229.9	45.2	53.7	254.2
75	231	206.3	237.1	46.2	54.7	278.4
80	246.8	215	244.8	51.3	55.8	302.9
85	269.6	227.6	254.8	107.7	56.9	340.4
90	292.4	242.3	265.9	189.3	72.7	506.7
95	330.9	263.3	284.2	257.8	130.9	548.3
100	440.2	411.6	524.5	552.8	330.2	578.8

Table F23 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.36

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltene	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	67.9	46.9	23.7	26.5	33.5	28.2
5	106.9	161.6	30.7	32.2	42.2	42.8
10	108.8	169.4	32.4	33.7	212.4	178.5
15	115.7	173.2	33.5	34.8	230.2	193.7
20	149.5	182	34.6	35.8	243.2	206.9
25	151.3	189.9	35.6	36.9	254.5	216.9
30	153.3	192.9	36.7	38.0	264.0	227.9
35	156	199.3	37.7	39.0	273.0	236.4
40	160.7	207.2	38.8	40.1	281.7	246.1
45	168.1	211.4	39.9	41.1	283.0	255.3
50	170	219.0	40.9	42.2	286.8	264.9
55	172.5	226.3	42.0	43.3	294.8	275.0
60	183	234.5	43.1	44.3	302.1	285.7
65	189.8	241.3	44.5	45.4	307.4	296.2
70	200.6	250.5	113.7	46.4	311.1	309.2
75	210.6	258.7	170.2	57.1	324.7	323.7
80	222.1	268.8	198.6	110.4	339.9	344.1
85	238.9	280.1	289.8	162.1	362.4	356.4
90	267.7	294.6	333.1	174.9	393.4	357.5
95	304.6	314.8	361.9	215.2	456.6	398.2
100	415.6	409.6	554.7	546.8	570.2	549.4

Table F24 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.50

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.2	35.4	42.2	28.4	34.8	35.4
5	109.1	122.0	184.9	32.9	43.1	43.3
10	117.3	153.7	192.4	33.9	44.1	44.3
15	152.3	162.6	204.7	35.0	45.2	45.4
20	154.5	169.5	207.9	36.0	46.2	46.4
25	157.7	173.4	211.6	37.1	47.3	47.5
30	167.8	181.6	217.2	38.2	48.4	48.6
35	170.5	188.7	223.3	41.6	49.4	49.6
40	175.9	193.4	226.1	43.3	75.4	50.7
45	184.9	199.7	231.6	170.2	213.4	51.8
50	191.2	207.0	238.0	227.3	253.5	52.8
55	200.3	213.0	240.0	238.6	262.6	53.9
60	206.5	220.5	244.4	245.2	269.8	54.9
65	213.1	228.1	249.2	254.0	277.9	56.0
70	220.8	236.6	255.4	258.3	283.7	75.7
75	229	243.9	259.7	266.0	290.7	98.3
80	240.1	252.9	266.1	272.4	299.9	178.4
85	256.9	262.8	273.3	280.7	310.0	215.8
90	279.1	277.6	284.3	293.3	323.3	272.4
95	317.6	304.0	307.7	318.6	353.1	358.4
100	433.8	517.0	526.8	552.0	558.2	570.9

Table F25 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.64

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatics	Di-aromatics	Poly-aromatics	Polar-aromatics
0	21.4	34.8	28.2	27.8	32.9	29.7
5	148.1	104.1	34.6	33.5	36	42.4
10	155	125.4	35.6	34.6	43.1	44.1
15	166.7	152.7	36.7	35.6	44.1	45.2
20	171.3	162.3	47.5	36.7	45.2	46.2
25	184.4	169.3	189.7	37.7	46.2	47.3
30	193.3	172.9	236.5	38.8	47.3	48.4
35	206.4	180.9	246.5	39.9	48.4	49.4
40	215.3	189.4	255.4	40.9	49.4	50.5
45	225	193.5	258.6	44.5	50.5	68.5
50	235.6	201.0	263.6	48.8	51.5	109.1
55	249.2	208.8	268.5	207.0	52.6	175.1
60	263.1	215.3	273.7	268.4	53.7	195.8
65	275.1	225.0	278.4	279.1	54.7	218.4
70	288.5	233.6	284.4	282.0	55.8	252.8
75	303.1	242.0	290.4	290.7	56.9	285.9
80	321.3	252.4	297.1	296.2	67	313.7
85	341.5	262.3	304.9	305.0	78.1	355.7
90	369.1	276.5	316.7	315.2	209.5	400.2
95	405.4	301.5	338.1	330.7	328.2	530
100	477.1	417.1	546.7	549.2	545.1	576.5

Table F26 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 0.75

Tire = 30g, N_2 flow = 25ml/min

Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

	Boiling point (°C)					
% OFF	Pyrolyzed oil	Saturated Hydrocarbons	Mono-aromatic	Di-aromatic	Poly-aromatic	Polar-aromatic
0	25.6	31.8	29.2	31.2	28.8	19.5
5	70.4	108.8	190.4	42.0	54.3	26.9
10	72.5	156.5	253.3	87.5	61.3	41.4
15	75.4	171.1	271.0	206.5	237.6	54.5
20	144	181.8	282.2	223.8	269.5	57.1
25	155.5	193.3	290.3	236.7	290.1	224.9
30	167.5	201.8	296.8	248.6	304.7	258.3
35	170.5	209.8	302.9	254.8	316.9	285.7
40	177.6	219.6	307.5	262.1	327.8	304.3
45	184	229.5	312.4	270.3	335.6	318.3
50	189.9	240.4	318.0	277.1	345.4	331.0
55	196.8	250.7	322.7	284.2	352.3	342.6
60	203.1	260.2	328.5	291.8	358.5	351.8
65	210.3	270.7	334.0	300.4	365.8	360.3
70	217.2	282.3	341.6	310.1	373.3	369.8
75	224	297.2	350.7	319.7	380.3	378.2
80	234.6	312.2	361.9	332.5	389.9	389.4
85	250.6	332.3	376.9	349.5	401.1	402.2
90	272.9	359.4	400.1	370.8	416.8	420.8
95	309.2	398.1	454.9	406.3	442.8	455.5
100	417.7	551.5	567.1	557.0	520.8	532.0

Table F27 Pyrolysis conditions: Catalytic Pyrolysis Using RuNi/HMOR α = 1.0

Tire = 30g, N_2 flow = 25ml/min

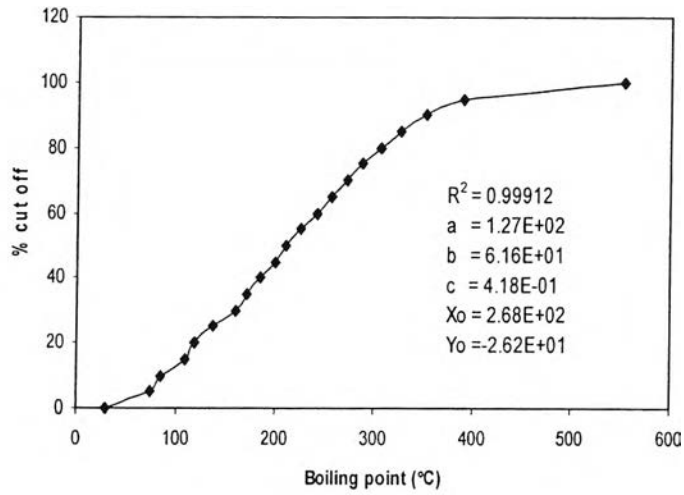
Pyrolysis Zone Temperatures (T2) : set value = 500°C

Catalyst Zone Temperature (T1): set value = 350°C

% OFF	Boiling point (°C)					
	Maltenes	Saturated Hydrocarbons	Mono-aromatic	Di-aromatic	Poly-aromatic	Polar-aromatic
0	25.8	32.6	31.1	29	27.8	25.6
5	111.6	116.2	40.1	39.2	39.9	33.9
10	151.4	160.6	46	40.3	52	53.7
15	154	172.1	172.9	41.4	53	54.9
20	157.9	181.8	209.3	42.4	54.1	109.8
25	168.5	192.4	237.6	53.5	55.2	167.2
30	171.5	201.1	253.3	224	56.2	185.3
35	181.8	208.2	267	269.9	57.3	191.9
40	189.3	217.3	272.6	284.7	58.3	204.1
45	195.9	225.5	279.4	293.4	59.4	220.1
50	203.9	235.7	286.8	298.8	81.8	236
55	211.4	245	293.4	306.7	82.6	251.5
60	217.9	254.2	298	312	205.8	265.6
65	225	263.3	304.4	318.4	276.9	279.5
70	233.1	272.2	312	325.8	298	296.1
75	244.7	283.5	320.3	334.5	316.1	314.8
80	259.2	297	330.7	343.4	331.1	337.4
85	276.3	312.5	343.1	354.5	350.1	368.9
90	300.8	334.6	361.2	367.4	370.2	413.4
95	346.2	371.9	393.1	390.8	407.3	525.6
100	464.2	561.6	564.8	552.1	562.7	573.9

G. CARBON NUMBER DISTRIBUTION OF MALTENES

Example: True Boiling Point (TBP) Curve from Sigma Plot



The equation is

$$y = y_0 + \frac{a}{\left[\left(1 + e^{-\left(\frac{X - X_0}{b}\right)}\right)\right]^C}$$

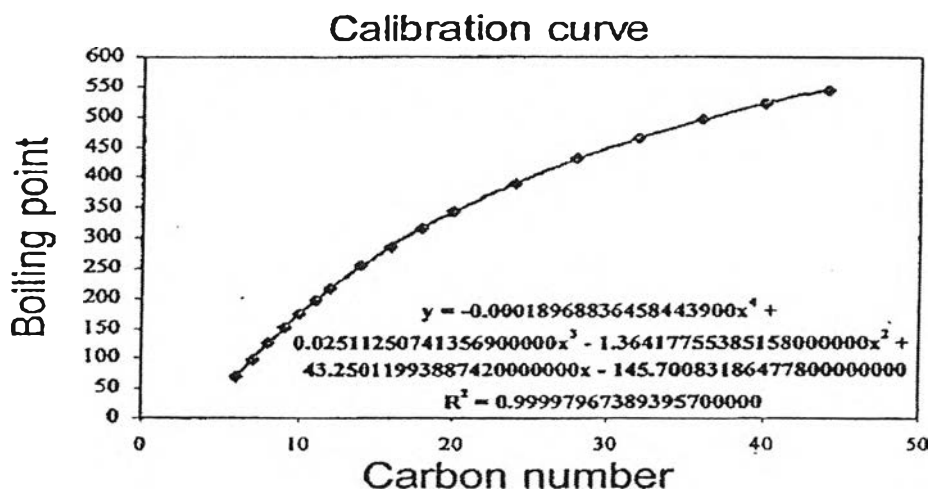


Figure J1 GC Calibration Curve of ASTM D2887

The Carbon number Distribution

No. carbon.	B.P.	% Accumulate	% Yield
5	37.713	0.302	
6	68.589	6.271	5.969
7	97.475	12.929	6.658
8	124.500	20.173	7.244
9	149.789	27.840	7.667
10	173.462	35.718	7.878
11	195.634	43.562	7.844
12	216.415	51.126	7.564
13	235.909	58.194	7.068
14	254.218	64.609	6.415
15	271.435	70.283	5.674

Note:

1. **B.P.** = GC Calibration Curve of ASTM D2887

2. **% Accumulate** come from $$y = y_0 + \frac{a}{\left[\left(1 + e^{-\left(\frac{X - X_0}{b}\right)}\right)\right]^C}$$

3. **% Yield** = % Accumulate $_n$ - % Accumulate $_{n-1}$

Table G1 Influences of Pyrolysis Temperatures

Carbon number	T = 500°C	T = 600°C	T = 700°C
5	0.119864	0.065348	0.01455
6	0.682611	0.211957	0.203569
7	2.058173	0.622852	1.069016
8	4.065892	1.619591	2.96308
9	6.06046	3.547066	5.408836
10	7.484436	6.148148	7.513496
11	8.148985	8.225791	8.727622
12	8.153986	8.896425	9.015935
13	7.710868	8.440241	8.625083
14	7.023573	7.507447	7.848757
15	6.243031	6.503372	6.916921
16	5.464242	5.588235	5.975219
17	4.738997	4.802936	5.10147
18	4.090445	4.144005	4.328895
19	3.52465	3.594922	3.664956
20	3.038453	3.137429	3.103906
21	2.62434	2.755101	2.63429
22	2.273254	2.434149	2.243039
23	1.9761	2.163303	1.917527
24	1.724481	1.933436	1.646461
25	1.51099	1.737174	1.420158
26	1.329271	1.568545	1.230521
27	1.17396	1.4227	1.07088
28	1.040585	1.295683	0.935788
29	0.925438	1.184254	0.820826
30	0.825459	1.085749	0.72241
31	0.73813	0.99797	0.637646
32	0.661384	0.919095	0.56419
33	0.593518	0.847614	0.500143
34	0.533134	0.782265	0.443962
35	0.479079	0.721995	0.394393
36	0.430398	0.665919	0.350406
37	0.386299	0.61329	0.311155
38	0.346116	0.563469	0.275937
39	0.309284	0.515906	0.244161
40	0.275316	0.470116	0.215325
41	0.243784	0.425661	0.18899
42	0.214299	0.382133	0.16477
43	0.1865	0.339134	0.14231
44	0.160034	0.296263	0.121275
45	0.134545	0.253095	0.101336
46	0.109658	0.209161	0.082156
47	0.084962	0.163925	0.063377
48	0.059986	0.11676	0.044598
49	0.034176	0.066911	0.025353
50	0.006854	0.013454	0.00508

Table G2 Influences of HBETA, HMOR and Noble Metals-supported Catalysts

Carbon number	HBETA	HMOR	PtHMOR	ReHMOR	RuHMOR	RhHMOR
5	1.943	4.595	2.641	0.012	2.689	0.000
6	3.156	5.965	4.121	0.159	4.637	0.000
7	4.863	7.336	6.220	1.004	7.347	0.127
8	7.037	8.500	9.077	3.370	10.454	2.514
9	9.418	9.241	12.719	6.973	13.023	10.107
10	11.439	9.418	16.612	10.204	13.957	17.055
11	12.401	9.025	18.585	11.786	12.879	18.109
12	11.915	8.187	15.408	11.651	10.457	15.129
13	10.227	7.097	8.697	10.431	7.730	11.207
14	8.007	5.940	3.682	8.784	5.387	7.844
15	5.875	4.848	1.385	7.133	3.640	5.367
16	4.141	3.892	0.516	5.678	2.431	3.656
17	2.861	3.096	0.198	4.477	1.625	2.504
18	1.964	2.453	0.079	3.521	1.095	1.733
19	1.352	1.943	0.033	2.773	0.747	1.215
20	0.938	1.543	0.015	2.194	0.517	0.864
21	0.657	1.231	0.007	1.746	0.363	0.623
22	0.466	0.988	0.003	1.399	0.258	0.455
23	0.335	0.798	0.002	1.129	0.186	0.337
24	0.244	0.649	0.001	0.918	0.136	0.253
25	0.179	0.531	0.000	0.752	0.101	0.192
26	0.133	0.437	0.000	0.620	0.076	0.147
27	0.100	0.362	0.000	0.515	0.057	0.114
28	0.076	0.302	0.000	0.430	0.044	0.089
29	0.058	0.253	0.000	0.361	0.034	0.070
30	0.045	0.213	0.000	0.305	0.026	0.056
31	0.035	0.180	0.000	0.259	0.021	0.045
32	0.027	0.153	0.000	0.220	0.016	0.036
33	0.022	0.131	0.000	0.188	0.013	0.029
34	0.017	0.111	0.000	0.161	0.010	0.023
35	0.014	0.095	0.000	0.138	0.008	0.019
36	0.011	0.082	0.000	0.119	0.007	0.016
37	0.009	0.070	0.000	0.102	0.005	0.013
38	0.007	0.060	0.000	0.088	0.004	0.011
39	0.006	0.052	0.000	0.075	0.003	0.009
40	0.005	0.044	0.000	0.065	0.003	0.007
41	0.004	0.038	0.000	0.055	0.002	0.006
42	0.003	0.032	0.000	0.047	0.002	0.005
43	0.002	0.027	0.000	0.040	0.001	0.004
44	0.002	0.022	0.000	0.033	0.001	0.003
45	0.001	0.018	0.000	0.027	0.001	0.003
46	0.001	0.015	0.000	0.022	0.001	0.002
47	0.001	0.011	0.000	0.016	0.001	0.001
48	0.001	0.008	0.000	0.011	0.000	0.001
49	0.000	0.004	0.000	0.006	0.000	0.001
50	0.000	0.001	0.000	0.001	0.000	0.000

Table G3 Influences of SBA-1 and Ru/SBA-1 Catalysts

No. carbon	SBA-1	2.5Ru/SBA-1	4.0Ru/SBA-1	4.5Ru/SBA-1
5	0.345539	6.79E-10	0.011468	0.444211
6	1.281421	0.000119	0.103851	1.425606
7	2.936103	0.053691	0.62003	3.00489
8	4.87296	1.284563	2.381619	4.764475
9	6.511585	6.382812	5.967758	6.224879
10	7.517674	13.04459	10.28853	7.126037
11	7.861864	16.2118	13.19006	7.451771
12	7.689516	15.33698	13.64441	7.323873
13	7.18914	12.5277	12.22033	6.899771
14	6.522026	9.4781	9.996114	6.316734
15	5.801597	6.908256	7.751064	5.674103
16	5.097363	4.959632	5.839189	5.035135
17	4.446441	3.551603	4.34141	4.43553
18	3.864825	2.554884	3.217059	3.892343
19	3.355958	1.85347	2.390248	3.411062
20	2.916484	1.358778	1.787016	2.990557
21	2.539837	1.007521	1.34706	2.626283
22	2.218314	0.755789	1.024848	2.312223
23	1.94422	0.573464	0.787245	2.042019
24	1.710426	0.439927	0.610556	1.80956
25	1.510604	0.341007	0.477945	1.609282
26	1.339282	0.266906	0.377457	1.43627
27	1.191803	0.210787	0.300569	1.28627
28	1.064249	0.167837	0.241176	1.155646
29	0.953345	0.134636	0.194872	1.041321
30	0.856366	0.108727	0.15845	0.940706
31	0.771051	0.088327	0.129559	0.851629
32	0.695528	0.072132	0.106461	0.772277
33	0.628248	0.059175	0.087857	0.701136
34	0.567929	0.048736	0.072771	0.636944
35	0.513508	0.04027	0.060459	0.578648
36	0.464099	0.033364	0.050354	0.525367
37	0.418964	0.027699	0.042015	0.476361
38	0.37748	0.023027	0.035097	0.431003
39	0.339115	0.019156	0.02933	0.388754
40	0.303409	0.015931	0.024499	0.349147
41	0.269952	0.01323	0.020428	0.31176
42	0.238371	0.010953	0.016978	0.276208
43	0.208312	0.009019	0.014029	0.242121
44	0.179426	0.00736	0.011485	0.209129
45	0.151355	0.005917	0.00926	0.176848
46	0.123717	0.00464	0.00728	0.144862
47	0.096083	0.003483	0.005475	0.112703
48	0.067962	0.0024	0.003779	0.079824
49	0.038767	0.001346	0.002121	0.045573
50	0.007779	0.000268	0.000423	0.009148

Table G4 Influences of MCM-41 and Ru/MCM-41 Catalysts

No. carbon	MCM-41	MCM41 (450)	MCM41 (400)	1%Ru/MCM-41	1.5%Ru/MCM-41	2%Ru/MCM-41
5	0.123	0.002	0.000	0.000	0.000	0.102
6	0.521	0.108	0.003	0.000	0.000	0.385
7	2.103	1.036	0.349	0.033	0.002	1.956
8	6.235	3.768	3.844	1.435	0.608	9.266
9	11.128	7.540	11.580	8.363	8.674	24.093
10	15.994	10.445	17.076	16.768	22.656	25.038
11	16.251	11.547	17.165	19.088	24.648	17.386
12	13.706	11.119	14.119	16.262	17.819	10.275
13	10.487	9.846	10.491	12.003	10.844	5.752
14	7.646	8.293	7.429	8.286	6.201	3.196
15	5.461	6.786	5.161	5.569	3.502	1.799
16	3.880	5.468	3.574	3.721	1.997	1.034
17	2.766	4.377	2.488	2.500	1.161	0.609
18	1.988	3.499	1.750	1.698	0.690	0.368
19	1.444	2.804	1.246	1.169	0.420	0.227
20	1.061	2.256	0.899	0.817	0.262	0.144
21	0.790	1.826	0.657	0.580	0.167	0.093
22	0.595	1.488	0.487	0.418	0.109	0.061
23	0.453	1.221	0.365	0.305	0.072	0.041
24	0.349	1.009	0.277	0.225	0.049	0.028
25	0.272	0.839	0.213	0.169	0.033	0.019
26	0.214	0.702	0.165	0.128	0.023	0.014
27	0.169	0.591	0.129	0.098	0.016	0.010
28	0.136	0.501	0.102	0.076	0.012	0.007
29	0.109	0.427	0.081	0.059	0.008	0.005
30	0.089	0.365	0.065	0.046	0.006	0.004
31	0.072	0.313	0.053	0.037	0.005	0.003
32	0.059	0.270	0.043	0.029	0.003	0.002
33	0.049	0.233	0.035	0.023	0.003	0.002
34	0.040	0.202	0.028	0.019	0.002	0.001
35	0.033	0.175	0.023	0.015	0.001	0.001
36	0.028	0.152	0.019	0.012	0.001	0.001
37	0.023	0.132	0.016	0.010	0.001	0.001
38	0.019	0.115	0.013	0.008	0.001	0.000
39	0.016	0.100	0.011	0.007	0.000	0.000
40	0.013	0.086	0.009	0.005	0.000	0.000
41	0.011	0.074	0.007	0.004	0.000	0.000
42	0.009	0.064	0.006	0.004	0.000	0.000
43	0.008	0.054	0.005	0.003	0.000	0.000
44	0.006	0.046	0.004	0.002	0.000	0.000
45	0.005	0.038	0.003	0.002	0.000	0.000
46	0.004	0.030	0.003	0.001	0.000	0.000
47	0.003	0.023	0.002	0.001	0.000	0.000
48	0.002	0.016	0.001	0.001	0.000	0.000
49	0.001	0.009	0.001	0.000	0.000	0.000
50	0.000	0.002	0.000	0.000	0.000	

Table G5 Influences of RuNi/HMOR Bimetallic Catalysts

No. carbon.	α = 0.0	α = 0.25	α = 0.36	α = 0.50	α = 0.64	α = 0.75	α = 1.0
5	0.000	0.000	0.009	0.028	0.008	0.000	0.000
6	0.001	0.000	0.153	0.232	0.172	0.000	0.001
7	0.143	0.134	1.547	1.326	1.133	0.041	0.200
8	2.182	3.365	7.643	4.903	3.459	2.144	2.691
9	8.331	13.440	17.985	11.328	6.481	11.886	9.405
10	14.562	20.620	22.800	16.909	8.910	20.937	15.456
11	16.508	19.515	19.067	17.866	10.063	20.733	16.790
12	14.796	14.631	12.663	14.928	10.033	15.606	14.606
13	11.705	9.863	7.558	10.848	9.244	10.382	11.310
14	8.688	6.368	4.343	7.327	8.107	6.573	8.263
15	6.260	4.065	2.486	4.793	6.898	4.107	5.882
16	4.463	2.606	1.441	3.109	5.767	2.577	4.154
17	3.183	1.691	0.853	2.026	4.777	1.639	2.940
18	2.285	1.115	0.516	1.336	3.942	1.060	2.097
19	1.656	0.748	0.319	0.893	3.253	0.698	1.511
20	1.213	0.511	0.202	0.607	2.691	0.468	1.102
21	0.900	0.355	0.131	0.419	2.234	0.320	0.813
22	0.675	0.251	0.086	0.294	1.864	0.222	0.608
23	0.513	0.180	0.058	0.210	1.563	0.157	0.460
24	0.393	0.131	0.040	0.151	1.319	0.113	0.352
25	0.305	0.096	0.028	0.111	1.119	0.082	0.272
26	0.239	0.072	0.019	0.082	0.954	0.060	0.213
27	0.189	0.054	0.014	0.062	0.818	0.045	0.168
28	0.151	0.041	0.010	0.047	0.705	0.034	0.133
29	0.121	0.032	0.007	0.036	0.610	0.026	0.107
30	0.098	0.025	0.005	0.027	0.530	0.020	0.086
31	0.079	0.019	0.004	0.021	0.462	0.015	0.070
32	0.065	0.015	0.003	0.017	0.404	0.012	0.057
33	0.053	0.012	0.002	0.013	0.354	0.009	0.047
34	0.044	0.009	0.002	0.010	0.311	0.007	0.038
35	0.036	0.008	0.001	0.008	0.273	0.006	0.032
36	0.030	0.006	0.001	0.007	0.240	0.005	0.026
37	0.025	0.005	0.001	0.005	0.211	0.004	0.022
38	0.021	0.004	0.001	0.004	0.185	0.003	0.018
39	0.017	0.003	0.000	0.003	0.163	0.002	0.015
40	0.014	0.003	0.000	0.003	0.142	0.002	0.012
41	0.012	0.002	0.000	0.002	0.124	0.001	0.010
42	0.010	0.002	0.000	0.002	0.107	0.001	0.009
43	0.008	0.001	0.000	0.001	0.092	0.001	0.007
44	0.007	0.001	0.000	0.001	0.078	0.001	0.006
45	0.005	0.001	0.000	0.001	0.065	0.001	0.005
46	0.004	0.001	0.000	0.001	0.052	0.000	0.004
47	0.003	0.000	0.000	0.000	0.040	0.000	0.003
48	0.002	0.000	0.000	0.000	0.028	0.000	0.002
49	0.001	0.000	0.000	0.000	0.016	0.000	0.001
50	0.000	0.000	0.000	0.000	0.003	0.000	0.000

H. PETROELUM FRACTIONS OF DERIVED OILS

Table H1 Influences of Pyrolysis Temperatures

	T = 500°C	T = 600°C	T = 700°C
Naphtha	31.20	24.30	23.90
Kerosene	18.90	21.70	21.40
Light Gas Oil	16.10	19.20	18.60
Heavy Gas Oil	19.6	18.8	18.9
Residues	14.2	16	17.2

Table H2 Influences of HBETA, HMOR and Noble Metals-supported Catalysts

	HBETA	HMOR	Pt/HBETA	Re/HMOR	Rh/HMOR	Pt/HMOR	Ru/HMOR
Naphtha	48.7	50.2	60.3	37.9	56.5	58.4	64.8
Kerosene	17.1	17.1	24.2	24.8	23.2	20.8	20.5
LGO	15.6	16.4	6.8	18.9	9.6	9.5	8.2
HVG	9.7	8.8	4.8	10.3	5.3	6.2	3.4
Residues	8.9	7.5	3.9	8.1	5.4	5.1	3.1

Table H3 Influences of SBA-1 and Ru/SBA-1 Catalysts

	SBA-1	4.5Ru/SBA-1	4.0Ru/SBA-1	2.5Ru/SBA-1
Naphtha	34	38	39	44
Kerosene	21	27	25	28
Light GO	15	17	20	14
Heavy GO	18	12	10	9
Residue	12	6	7	5

Table H4 Influences of MCM-41, Catalyst Temperatures and Ru/MCM-41

	MCM-41			1%Ru/MCM-41	1.5%Ru/MCM-41	2%Ru/MCM-41
	300°C	350°C	400°C			
Naphtha	49.48	51.45	37.20	52.8	60	63
Kerosene	26.16	26.16	25.23	27.9	31	28.5
Light GO	12.71	15.86	26.97	9.6	4.6	4.1
Heavy GO	6.00	2.48	4.14	4.5	1.3	1.4
Residue	5.65	3.46	5.58	5.2	3.1	3

Table H5 Influences of RuNi/HMOR Bimetallic Catalysts

	α = 0	α = 0.25	α = 0.36	α = 0.50	α = 0.64	α = 0.75	α = 1
Naphtha	45.1	59.2	72.2	55.4	52.6	57.6	48.8
Kerosene	29.9	21.8	15.8	27.6	24.5	26.9	28.2
GO	21	15	10	14.2	17.9	13	19
Resides	4	4	2	2.8	5	2.5	4

I. ELEMENTAL ANALYSIS OF PYROLYSIS PRODUCTS

Table I1 Non-catalytic Pyrolysis (500°C)

	C (wt%)	H (wt%)	H/C*
Oil	83.7	10.8	**1.54**
Solid	90.6	1.8	
Gas**	72.6	16.8	**2.77**

Table I2 Catalytic Pyrolysis using MCM-41

	C (wt%)	H (wt%)	H/C*
Oil	82.9	11.1	**1.61**
Solid	90.9	1.8	
Spent catalyst	6.9	0.4	
Gas**	73.1	15.8	**2.59**

Table I3 Catalytic Pyrolysis using 2%Ru/MCM-41

	C (wt%)	H (wt%)	H/C*
Oil	82.1	13.2	**1.93**
Solid	91.2	1.4	
Spent catalyst	10.9	0.6	
Gas**	80.8	14.6	**2.17**

** Atomic ratio*

*** Determined by Mass Balance*

J. ASPHALTENES

	Catalysts/Conditions	Asphaltenes (g/g oil)
Pyrolysis Temperatures	Non-catalytic T = 500°C	0.001177645
	Non-catalytic T = 600°C	0.001354227
	Non-catalytic T = 700°C	0.001410152
Noble Metal-supported Catalysts	HBETA	0.000549431
	HMOR	0.000475192
	Ru/HMOR	0.000427421
	Pt/HMOR	0.000454983
	Rh/HMOR	0.000309917
	Re/HMOR	0.000654762
	Pt/HBETA	0.000514297
Ru/SBA-1 Catalysts	SBA-1	0.000798122
	2.5Ru/SBA-1	0.000563380
	4.0Ru/SBA-1	0.000514019
	4.5Ru/SBA-1	0.000418605
Ru/MCM-41 Catalysts	MCM-41 Tc = 350°C	0.000646388
	MCM-41 Tc = 400°C	0.000531561
	MCM-41 Tc = 450°C	0.000739726
	1%Ru/MCM-41	0.000489510
	1.5%Ru/MCM-41	0.000419847
	2%Ru/MCM-41	0.000221239
Bimetallic Catalysts	RuNi/HMOR $\alpha = 0$	0.000385894
	RuNi/HMOR $\alpha = 0.25$	0.000476363
	RuNi/HMOR $\alpha = 0.36$	0.000391075
	RuNi/HMOR $\alpha = 0.50$	0.000394607
	RuNi/HMOR $\alpha = 0.64$	0.000629630
	RuNi/HMOR $\alpha = 0.75$	0.000682206
	RuNi/HMOR $\alpha = 1.0$	0.000476363

K. GAS COMPOSITIONS

Correlation Factor of Light Hydrocarbon using GC which equipped with FID

Components	Factor
Methane	1
Ethylene	0.946536
Ethane	1.009963
Propylene	0.973512
Propane	0.989204
C4	0.982421
C5	0.984112
C6	0.939427
C7	0.918044
C8	0.968731

$\%wt\ of\ Gas_i$ = Area of Gas_i (from GC) x $Factor_i$ / Σ (Area x Factor) x100

Table K1 Influences of Pyrolysis Temperatures (wt%)

Compositions	T = 500°C	T = 600°C	T = 700°C
Methane	16.02	21.18	23.04
Ethylene	7.88	10.80	9.98
Ethane	14.43	14.90	12.67
Propylene	9.50	11.26	9.43
Propane	8.07	6.50	5.87
C4	21.21	17.62	18.28
C5	14.16	10.61	10.80
C6	6.71	5.18	7.33
C7	1.11	0.67	1.12
C8	0.92	1.29	1.46

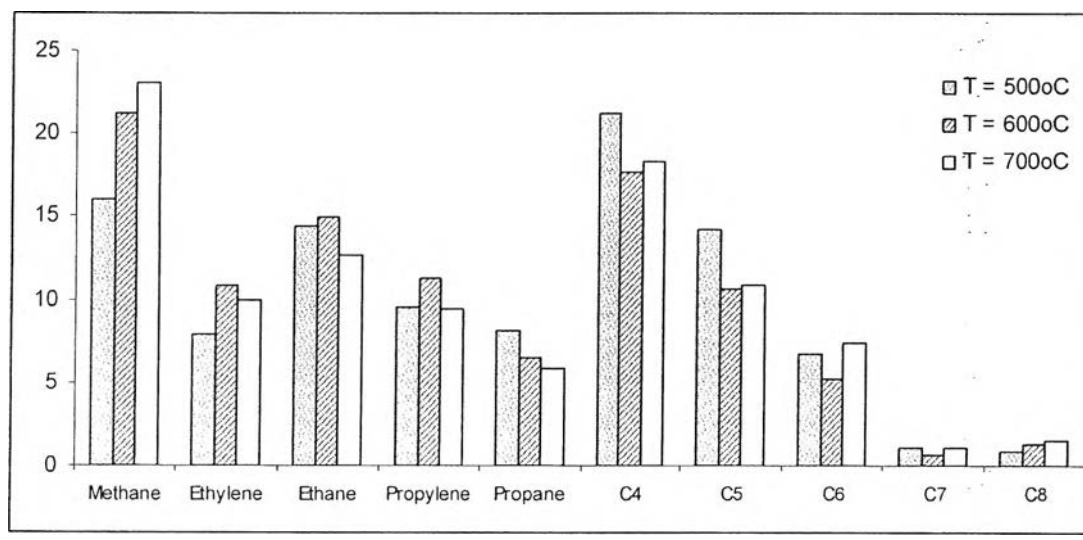


Figure K1 Gas Compositions (wt%)

Table K2 Influences of HBETA, HMOR and Noble Metals-supported Catalysts

	BEA	MOR	RuMOR	RhMOR	ReMOR	PtMOR
Methane	9.43	15.11	27.00	19.59	21.51	14.01
Ethylene	3.83	4.15	24.55	7.69	7.15	7.21
Ethane	8.51	14.06	10.44	15.77	18.52	17.59
Propylene	6.49	6.54	12.28	10.85	9.95	7.47
Propane	9.12	16.45	3.90	8.85	14.01	13.26
C4	30.30	20.90	10.12	23.83	19.37	20.19
C5	24.99	15.23	3.85	11.12	7.90	11.96
C6	6.12	5.86	5.60	2.21	1.42	6.10
C7	0.80	1.01	0.00	0.10	0.16	1.14
C8	0.40	0.70	2.26	0.00	0.00	1.08

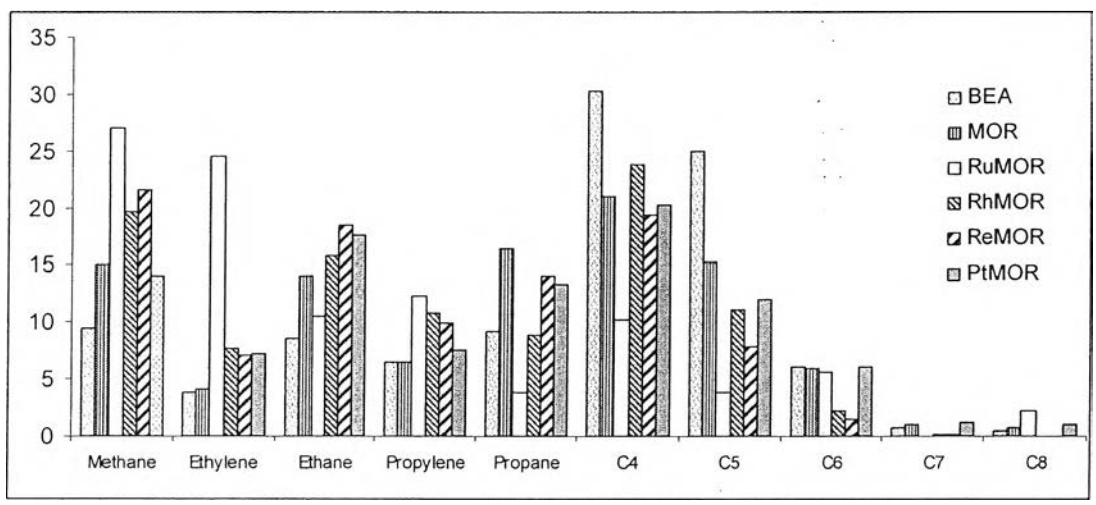


Figure K2 Gas Compositions (wt%)

Table K3 Influences of SBA-1 and Ru/SBA-1 Catalysts

	SBA-1	2.5Ru/SBA-1	4.9Ru/SBA-1	4.5Ry/SBA-1
Methane	18.15	19.84	18.84	19.75
Ethylene	10.24	11.21	10.91	11.63
Ethane	17.14	19.07	18.28	19.59
Propylene	11.16	12.67	12.34	13.21
Propane	8.52	10.19	9.85	10.54
C4	18.46	19.11	18.84	19.04
C5	13.07	7.17	10.34	5.71
C6	3.17	0.72	0.61	0.42
C7	0.05	0.00	0.00	0.10
C8	0.04	0.00	0.00	0.00

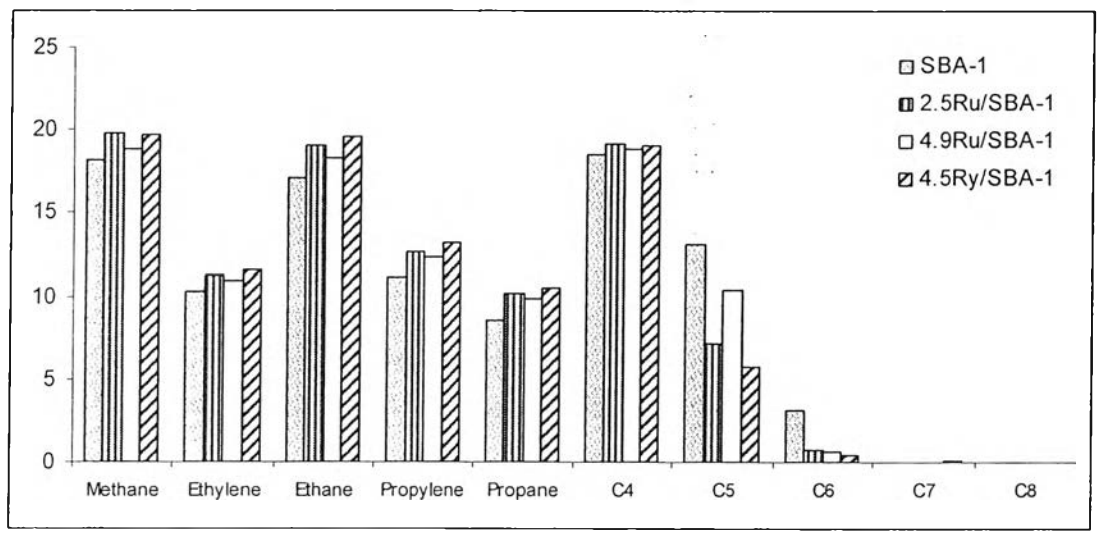


Figure K3 Gas Compositions (wt%)

Table K4 Influences of MCM-41, Catalyst Temperatures and Ru/MCM-41

	MCM-41			1.0%Ru/MCM-41	1.5%Ru/MCM-41	2%Ru/MCM-41
	350°C	400°C	450°C			
Methane	19.06	21.50	21.69	19.21	20.24	19.75
Ethylene	10.57	11.09	11.32	11.15	11.72	11.63
Ethane	17.62	19.31	19.67	18.48	19.32	19.59
Propylene	11.78	12.14	12.28	12.55	13.09	13.21
Propane	8.76	9.49	9.73	9.83	10.10	10.54
C4	19.72	19.34	18.62	18.61	18.76	19.04
C5	8.79	6.24	6.08	9.79	6.40	5.71
C6	2.86	0.68	0.56	0.38	0.37	0.42
C7	0.50	0.22	0.05	0.00	0.00	0.10
C8	0.33	0.00	0.00	0.00	0.00	0.00

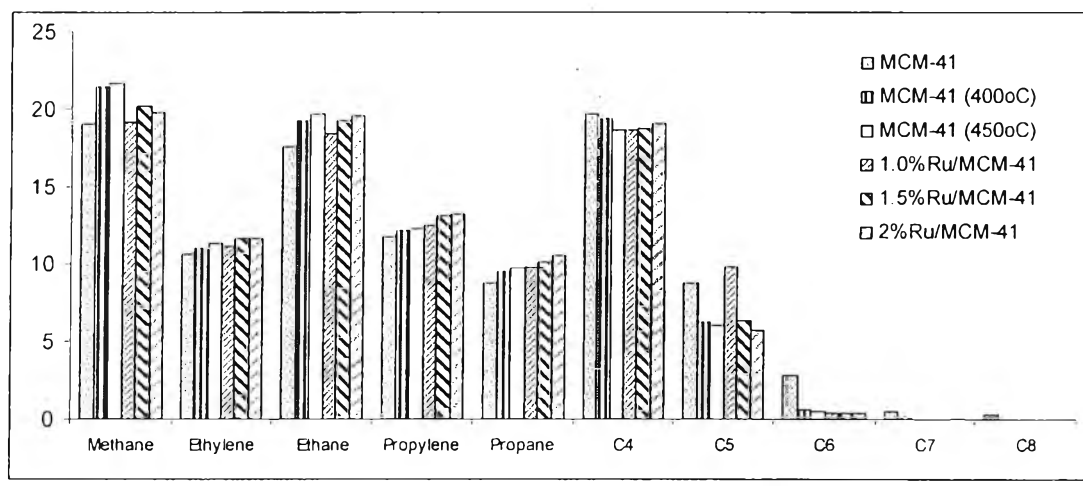


Figure K4 Gas Compositions (wt%)

Table K5 Influences of RuNi/HMOR Bimetallic Catalysts

	α = 0	α = 0.25	α = 0.36	α = 0.50	α = 0.64	α = 0.75	α = 1
Methane	21.53	18.76	18.12	17.88	16.20	17.98	15.84
Ethylene	6.08	5.30	5.56	5.39	4.20	5.70	5.80
Ethane	17.46	15.79	15.32	15.29	13.53	15.34	13.11
Propylene	9.12	8.52	8.37	8.27	7.71	8.52	8.16
Propane	13.12	11.38	10.94	11.84	12.35	11.55	5.47
C4	20.66	17.85	19.33	20.33	22.14	17.98	16.05
C5	8.91	11.84	11.54	12.21	13.70	12.41	18.19
C6	2.65	7.35	7.04	6.94	7.86	7.37	12.23
C7	0.30	1.16	2.68	1.86	2.31	1.08	5.15
C8	0.17	2.05	1.10	0.00	0.00	2.08	0.00

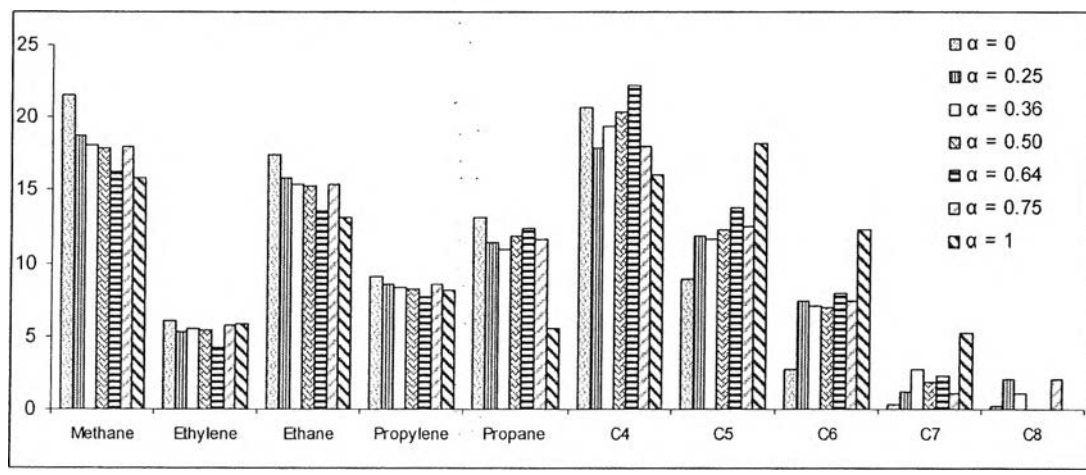


Figure K5 Gas Compositions (wt%)

L. METAL DISPERSION CALCULATIONS

	Weight (g)	%Pt	Pt (mol)	Total metal (mol)	Total metal A_o (atom)
Sample used	0.0502	1	2.57E-06	2.57E-06	1.55E+18
Mw of Pt (g/mol)	195.1				
Calibration factor(mol/mVs) F_c = 1*20*10^-6/300/0.08205784/V_o					

Peaks	Starting point	Finish point	Excess CO (mVs)	Chemisorbed CO (mVs)	
1	300	500	1.38E+05	16900	V1
2	880	1170	1.51E+05	3780	V2
3	1660	1960	1.47E+05	7420	V3
5	2600	2870	1.50E+05	4100	V4
7	3506	3710	1.51E+05	3700	V5
9	4600	5100	1.51E+05	3100	V6
10	5320	5600	1.54E+05	700	V7
11	6980	7200	1.55E+05		
12	7450	7880	1.55E+05		
		V_o of 20 ml CO =	154500		
			Total CO chemisorbed (mVs) = V, and V = Σ(V1:V7)	39700	2.09E-07
			Total CO chemisorbed (mol) = V_m =	$V * F_c$ =	2.09E-07
			Total CO chemisorbed (Atom) = V_a =	$V_m * N_A$ =	1.26E+17

Dispersion:

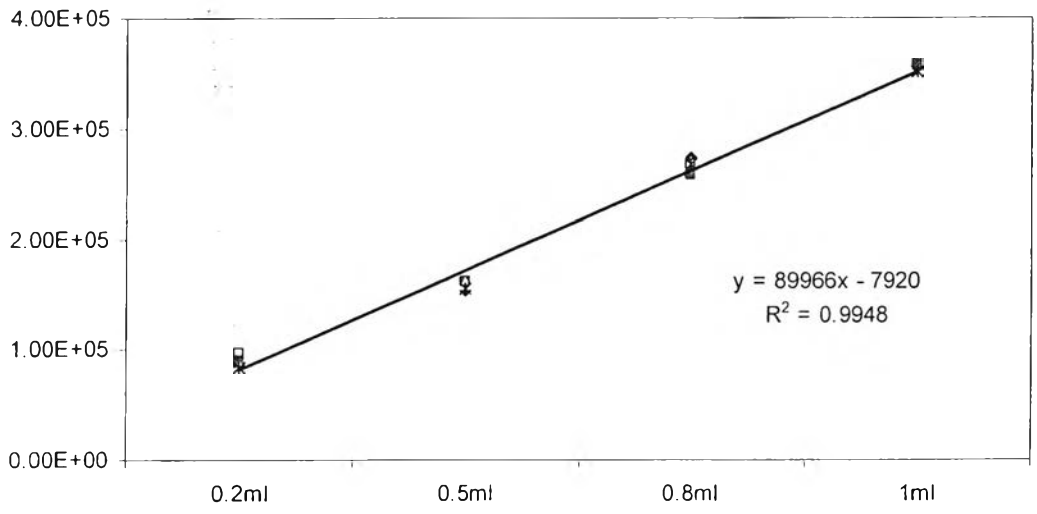
$D(\%) = (V_a / V_o) * 100\% = (1.26E+17)/(1.55E+18) = 8\%$

M. MEAN PARTICLE SIZE CALCULATION FROM TEM MEASUREMENT

Mean Diameter	Diameter (nm)	# of particles	nidi2	nidi3
0.5	0 – 1	80	20	10
1.5	1 – 2	124	279	418.5
2.5	2 – 3	111	693.75	1734
3.5	3 – 4	49	600.25	2101
4.5	4 – 5	24	486	2187
5.5	5 – 6	12	363	1997
	Σ =	400	2442	8447

The volume area mean diameter $d_{VA} = \Sigma n_i d_i^3 / \Sigma n_i d_i^2 = 3.5$ nm; $\mathbf{d_{VA} = 3.5\ nm}$

O. CALIBRATION CURVE OF TPD-NH3



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1. Dũng, N.A., Mhodmonthin, A., Wongkasemjit, S., and Jitkarnka, S. (2009) Effects of ITQ-21 and ITQ-24 as zeolite additives on the oil product obtained from catalytic pyrolysis of waste tire, Journal of Analytical and Applied Pyrolysis, 85 338-344.
2. Dũng, N.A., Wongkasemjit, S., and Jitkarnka, S., Effects of pyrolysis temperatures and Pt-loaded catalysts on polar-aromatic content in tire-derived oil, Applied Catalysis B: Environmental, Article in Press, DOI:10.1016/j.apcatb.2009.05.038.
3. Dũng, N.A., Klaewkla, R., Wongkasemjit, S., and Jitkarnka, S., Light olefins and light oil production from catalytic pyrolysis of waste tire, Journal of Analytical and Applied Pyrolysis, In Press, Accepted Manuscript.

Proceedings:

1. Dũng, N.A., Mhodmonthin, A., Wongkasemjit, S., and Jitkarnka, S., Effects of ITQ-21 and ITQ-24 as zeolite additives on the oil product obtained from catalytic

pyrolysis of waste tire, The 18th Symposium on Analytical and Applied Pyrolysis, 2008, Lanzarote, Spain.

2. Dũng, N.A., Choosuton, A., Wongkasemjit, S., and Jitkarnka, S., Catalytic pyrolysis of waste tire using Pt-supported HMOR and KL catalysts, 2008, 14th International Congress on Catalysis, Seoul, Korea