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Research article

Construction Waste Plastic and Household Mixed Plastics Mixture to Crude Fuel

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Abstract

Construction waste plastic and house hold waste plastics mixture to crude oil production process was laboratory scale batch process. For experiment purpose sample were use 50% construction waste plastic and 50% house hold plastic. Construction plastic was rubber types and house hold mixture waste plastics were combination of LDPE, HDPE, PP and PS. Stainless steel reactor was use for thermal degradation process. Electrical heat was use for melting purpose and temperature range was 300- 420 °C. Collected liquid was dark brown color and density is 0.78 g/ml. Liquid was analysis by GC/MS and analysis result indicate that carbon chain C_3 to C_{28}. In this experiment main goal was construction waste plastic to liquid crude oil collection without using chemical process.

Keywords: construction plastic, waste plastics, crude oil, hydrocarbon, thermal, GC/MS,

Introduction

The valorization of postconsumer plastics is a challenge for developed countries in view of the high production of these materials (20 million tonnes in the U.S., 15 tonnes in Europe, and 15 tonnes in Japan in the year 2001), with an estimated annual increase of 4%. Thermal pyrolysis is considered to be an appropriate solution for the treatment of all plastics overall and produces good yields of feedstock and fuel.[1,2] Given the good performance of the fluidized bed (uniform coating of sand particles with fused plastic, high heat transfer rate, and short residence time of the gas stream), plants of different scale based on this technology have been tested for the last 20 years.[3-9, 10] At present, hydrogen is commercially produced mostly by catalytic steam reforming of hydrocarbons: natural gas and naphtha. However, processes using other raw materials to produce hydrogen, especially wastes and byproducts, are also attractive because of promising economic and environmental benefits. In this research we explored possibilities for producing hydrogen from post-consumer waste plastics. Plastics, especially polyolefins, have significant potential but are not yet used as a resource for hydrogen production. Plastics account for 8-9% of today's waste stream, or about 15 million tons annually,[11] that are mostly disposed of in landfills. Potentially, these waste plastics could be used to generate six million tons of hydrogen per year. Though recycling of plastics has a positive environmental impact, in most cases it is not yet economically attractive.

So far, industry has focused efforts in plastics recycling on the recovery and reuse of polymers by mechanical processing. However, mechanical technologies require relatively clean feedstocks that are expensive to collect and separate. For this reason, commercial recycling has not had a significant impact with the collection rate of less than 5% of total annual resin sales. Producing hydrogen from waste plastics could complement conventional recycling techniques because it could use more complex materials that are not handled by existing processes, e.g. mixed plastics, polyester-cotton blends, rigid polyurethane foams. The challenge is to efficiently convert these polymers to hydrogen at a cost similar to that for the existing natural-gas-based technologies.[12] The coprocessing of petroleum vacuum residue with plastics was studied for exploring the possibility of its utilization to obtain lighter products, which may have an interesting product pattern. To understand the chemical reactions and chemical transformations, which could have taken place, during the coprocessing of petroleum residue with plastics; it was necessary to characterize the products obtained from coprocessing. In addition, characterization of the products would help in deciding the end use of the product. For example, cokes may have several applications which come out in the end of cracking. These cokes as such or after activation can be used for the removal of toxic substances from wastewater. The removal of toxic substances from wastewater using residue carbon (carbon slurry, activated carbon, bottom ash, etc.) has been reported in the literature.[13-19, 20] Our experiment main goal was construction plastic and waste plastics mixture to crude fuel production for refinery process.

Materials and Method

Construction waste plastic (Rubber type) and house hold mixture of waste plastics (LDPE, HDPE, PP and PS) mixture to crude oil production process was laboratory scale batch process. Whole process was performing under laboratory fume hood. Constriction waste plastic was black color and it was rubber type shown into figure 1. House hold plastics were use for experiment LDPE, HDPE, PP and PS mixture. LDPE was food container cover and transparent, HDPE was milk container and white color, PP was food container and black color, and PP was drinking glass and red color. Construction waste plastic and house hold waste plastics was washed with detergent before put inside reactor. Plastics washed our waste water keep into separate container for treatment purposed. Construction waste plastic and housed hold waste plastics were cut into mall pieces with scissor. Construction waste plastic sample and house hold waste plastics ratio was 50:50. For experimental purposed construction waste plastic was use 500 g and house holds mixture waste plastics was use 500 g. Experimental purpose total sample was use 1000 g. Both mixture plastics were placed into reactor chamber for thermal degradation process. Reactor was heated by electrical coil and temperature range was 300 – 420 °C. Reactor temperature cans researched up to 500 °C and variac meter was use for temperature controlling. Experimental process was shown figure 2. Experimental setup was reactor to condensation, condensation to crude collection, crude collection to crude storage, and crude collection to light gas storage after cleaning process. Initially construction waste plastic and house hold waste plastics mixture heated up by electrically and start to melt without adding any kind of chemical. When heat was increased low temperature to high temperature then all plastics materials polymer chain was break down and form into liquid. Due to continuous heat process is producing vapor then vapor turn into liquid form at the end crude was collected. Collected crude was little brownish dark color and it was ignited. Crude fuel density is 0.78 g/ml. Crude oil was collected and storage for further refinery process. In this experiment main goal was construction waste plastic to crude oil collection with house hold mixture waste plastics. Experimental process was successfully and fuel was collected 423.1 g and volume was 540 ml, light gas was generated 289.3 g samples and left over residue was 287.6 g. residue percentage was high because construction waste materials was rubber types. Figure 3 is showed crude oil and figure 4 is showed black color residue. Liquid and light gas conversion percentage is 71.24 % and residue percentage is 28.76%. Liquid crude oil was analysis by GC/MS to determine hydrocarbon compounds and light gas and residue investigation under investigation.

Production Calculation

Construction sample 500 g and waste plastics 500 g =1000 g

Crude oil weight =423.1 g and volume =540 ml

Residue weight =287.6 g

Light gas was generated = 289.3 g samples

Figure 1: Black color construction waste plastic

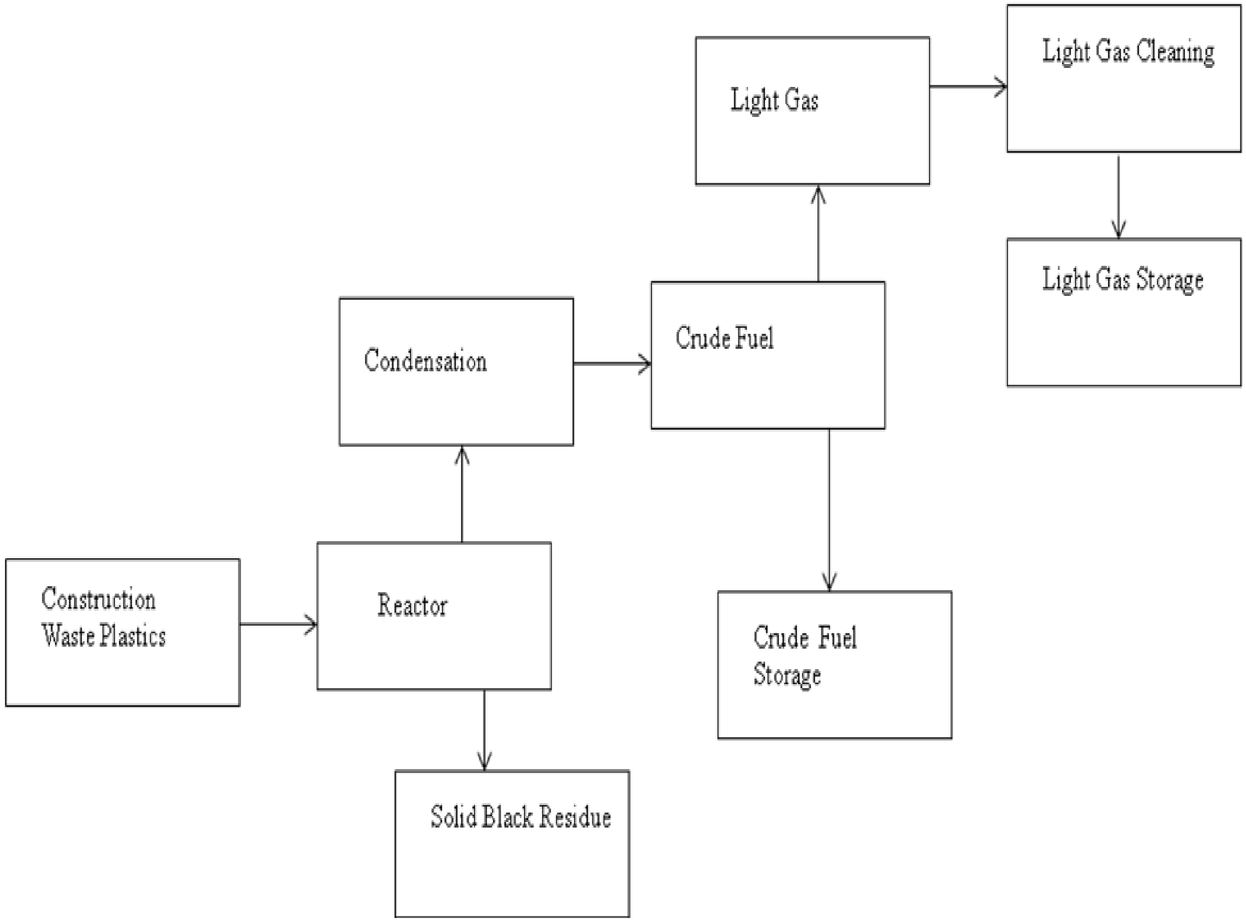

Figure 2: Construction plastic and mixed plastic to crude oil production process

Figure 3: Construction waste plastic and household waste plastics to crude oil

Figure 4: Left over black color residue

Waste water treatment process

Waste plastics washed out waste water was collected in to container for treatment. In this waste water treatment process was batch process with chemical treatment. Waste water was put into small bucket for per scan process by manually. Then checked P^H level with P^H meter because plastic was washing with detergent. After PH measurement added some alkali and acidic solution for P^H level stable. When added alkali and acidic solution into waste water after that we noticed some solid particles was going to down and some particle was coming to up. In this case was added ventonite clay to go down solid particle in bottom. Top portion water was taking out manually and keeps into another container and bottom portion sediment with water was filtered with filter paper. Filter out solid sludge dry out with oven and it be come solid. Separated water was retreated again with alkali and acidic solution same way. In this case filtration purpose was use activated carbon filter process. Then again filtered and separated water and solid part. Solid part was tested and test result give us there is no harmful compounds and its can discharge environment. Our generated waste water and treated water was tested by 3rd party and data table provided below table 1. Treated water was compared with EPA Connecticut, USA standard (Source Internet). Table 1 is showed before treated waste water test results and after waste water treated test results compare with EPA results. In 3rd party test results showed our treated waste water is clean and it can reuse again our process for waste plastic washing purpose. NSR whole process is cyclic process because NSR main goal to clean environment not to pollutant environment. Waste plastic to fuel production process and waste water treatment process perform at the same time for better environment safety.

Table 1: Comparative analysis report of Connecticut State EPA Discharge Permit Standard with NSR raw waste water and treated water

Serial #	Tested Pollutant Parameter	EPA (CT) Discharge Standard	NSR Raw Waste Water	NSR Treated Waste Water	Remarks
1.	Chromium Total	2.0mg/l	0.000621mg/l	ND	
2.	Copper Total	2.0mg/l	0.0512mg/l	ND	
3.	Lead Total	0.5mg/l	0.0756mg/l	ND	
4.	Zinc Total	2.0mg/l	0.257mg/l	ND	
5.	Oil and Grease Hydrocarbon Fraction (EPA Method 1664)	150.0mg/l	1520mg/l	ND	
6.	Total Suspended Solids	600.0mg/l	770mg/l	6mg/l	
7.	PH	5-11 Standard Units	6.86	8.64	
8.	BOD_5	600.0mg/l*	6,200mg/l	14mg/l	
9.	Phenols	10.0mg/l	ND	ND	
10.	Total Volatile Organics (EPA Methods 601& 602)	5.0mg/l			
10.1	1,1,1-Trichloroethane		ND	ND	
10.2	1,1,2.2-Tetrachloroethane		ND	ND	
10.3	1,1,2-Trichloroethane		ND	ND	
10.4	1,1-Dichloroethane		ND	ND	
10.5	1,1-Dichloroethylene		ND	ND	
10.6	1,2-Dichlorobenzene		ND	ND	
10.7	1,2-Dichloroethane		ND	ND	
10.8	1,2-Dichloropropane		ND	ND	
10.9	1,3-Dichlorobenzene		ND	ND	
10.10	1,4-Dichlorobenzene		ND	ND	
10.11	2-Chloroethylvinyl ether		ND	ND	

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10.12	Benzene	13µg/L	2.2µg/L	J
10.13	Bromodichloromethane	ND	ND	
10.14	Bromoform	ND	ND	
10.15	Bromomethane	ND	ND	
10.16	Carbon tetrachloride	ND	ND	
10.17	Chlorobenzene	ND	ND	
10.18	Chloroethane	ND	ND	
10.19	Chloroform	ND	ND	
10.20	Chloromethane	ND	ND	
10.21	Cis-1,2-Dichloroethylene	ND	ND	
10.22	Dibromochloromethane	ND	ND	
10.23	Dichlorodifluoromethane	ND	ND	
10.24	Ethyl Benzene	120µg/L	3.6µg/L	J
10.25	Methylene chloride	25µg/L	8.0µg/L	J,B
10.26	Tetrachloroethylene	ND	ND	
10.27	Toluene	220µg/L	17µg/L	
10.28	Trans-1,2-Dichloroethylene	ND	ND	
10.29	Trans-1,3-Dichloropropylene	ND	ND	
10.30	Trichloroethylene	ND	ND	
10.31	Trichlorofluoromethane	ND	ND	
10.32	Vinyl Chloride	ND	ND	

Note: B: Analyte is found in the associated analysis batch blank.

J: Detected below the reporting limit but greater than or equal to the Method Detection Limit (MDL); therefore, the result is an estimated concentration.

ND: Non Detectable

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Result and Discussion

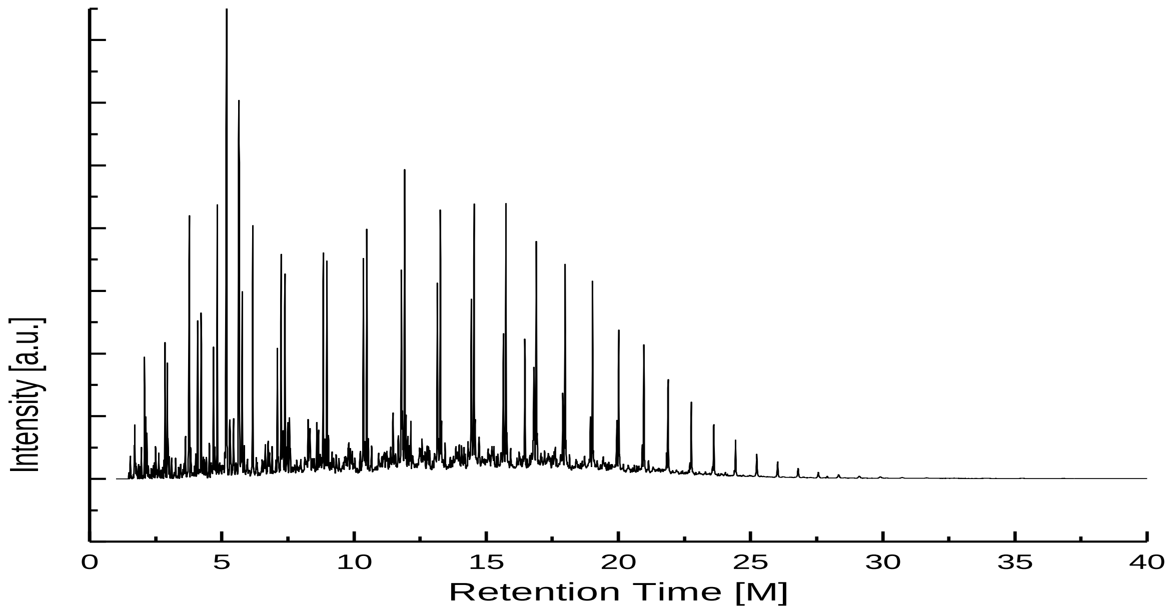

Figure 5: GC/MS chromatogram of construction plastic and mixed plastic to crude oil

Table 2: GC/MS chromatogram compounds list of Construction plastic and mixed plastic to crude oil

Peak Number	Retention Time (M.)	Trace Mass (m/z)	Compounds Name	Compound Formula	Molecular Weight	Probability Percentage	NIST Library Number
1	1.48	41	Propane	C_3H_8	44	29.0	18863
2	1.54	41	Butane, 1-isocyano-	C_5H_9N	83	16.3	156701
3	1.57	41	2-Butene, (E)-	C_4H_8	56	28.8	105
4	1.62	55	1-Butene, 3-methyl-	C_5H_{10}	70	38.5	160477
5	1.65	43	Butane, 2-methyl-	C_5H_{12}	72	77.6	61287
6	1.69	42	1-Pentene	C_5H_{10}	70	19.2	19081
7	1.71	43	Pentane	C_5H_{12}	72	82.8	114462
8	1.73	55	2-Pentene	C_5H_{10}	70	16.8	19079
9	1.77	55	Cyclopropane, 1,2-dimethyl-, cis-	C_5H_{10}	70	21.0	19070
10	1.79	67	1,3-Pentadiene	C_5H_8	68	23.5	291890
11	1.91	67	Pent-4-enylamine	$C_5H_{11}N$	85	9.34	195000
12	1.96	43	1-Pentanol, 2-methyl-	$C_6H_{14}O$	102	25.4	19924
13	2.08	56	1-Hexene	C_6H_{12}	84	18.4	500
14	2.12	57	Hexane	C_6H_{14}	86	84.7	61280
15	2.17	41	2-Pentene, 3-methyl-, (E)-	C_6H_{12}	84	17.5	19321
16	2.22	55	3-Hexene, (Z)-	C_6H_{12}	84	33.5	114381
17	2.33	56	Cyclopentane, methyl-	C_6H_{12}	84	57.8	114428
18	2.38	67	2,4-Hexadiene, (Z,Z)-	C_6H_{10}	82	13.2	113646

19	2.45	56	1-Pentene, 2,4-dimethyl-	C_7H_{14}	98	59.0	114435
20	2.50	67	Cyclopentane, 1-methyl-2-(2-propenyl)-, trans-	C_9H_{16}	124	9.37	26931
21	2.55	41	2-Hexene, 5-methyl-, (E)-	C_7H_{14}	98	9.47	114378
22	2.62	41	1-Pentanol, 2-ethyl-	$C_7H_{16}O$	116	19.4	114889
23	2.70	43	Hexane, 3-methyl-	C_7H_{16}	100	63.0	113081
24	2.77	67	Cyclohexene	C_6H_{10}	82	28.8	114431
25	2.82	56	1-Hexene, 2-methyl-	C_7H_{14}	98	39.1	114433
26	2.85	41	1-Heptene	C_7H_{14}	98	37.9	107734
27	2.94	43	Heptane	C_7H_{16}	100	75.0	61276
28	2.97	41	1,4-Hexadiene, 4-methyl-	C_7H_{12}	96	9.30	113135
29	3.02	55	2-Heptene	C_7H_{14}	98	32.1	113119
30	3.10	81	2-Heptene	C_7H_{14}	98	16.7	113119
31	3.25	83	Cyclohexane, methyl-	C_7H_{14}	98	49.2	118503
32	3.36	69	Cyclopentane, ethyl-	C_7H_{14}	98	46.2	231044
33	3.44	79	1-Cyclohexene-1-methanol	$C_7H_{12}O$	112	17.2	52048
34	3.57	81	Cyclopentene, 4,4-dimethyl-	C_7H_{12}	96	12.2	38642
35	3.62	41	5,10-Dioxatricyclo[7.1.0.0(4,6)]decane	$C_8H_{12}O_2$	140	7.21	150356
36	3.77	91	Toluene	C_7H_8	92	66.5	291301
37	3.82	81	Cyclohexene, 1-methyl-	C_7H_{12}	96	17.7	231491
38	3.96	41	(5-Methylcyclopent-1-enyl)methanol	$C_7H_{12}O$	112	25.6	99174
39	4.02	56	1-Heptene, 2-methyl-	C_8H_{16}	112	61.6	113675
40	4.09	55	1-Octene	C_8H_{16}	112	26.4	1604
10	4.22	43	Octane	C_8H_{18}	114	41.1	229407
42	4.30	55	2-Octene, (Z)-	C_8H_{16}	112	20.7	113889
43	4.35	95	Cyclopropane, (2,2-dimethylpropylidene)-	C_8H_{14}	110	8.71	60981
44	4.42	55	3-Octene, (Z)-	C_8H_{16}	112	16.3	227617
45	4.53	43	Heptane, 2,4-dimethyl-	C_9H_{20}	128	19.1	155382
46	4.69	83	2,3-Dimethyl-2-heptene	C_9H_{18}	126	17.6	113495
47	4.74	69	Cyclohexane, 1,3,5-trimethyl-, (1α,3α,5β)-	C_9H_{18}	126	16.2	2480
48	4.83	43	2,4-Dimethyl-1-heptene	C_9H_{18}	126	64.3	113516
49	5.19	91	Ethylbenzene	C_8H_{10}	106	57.1	158804
50	5.30	91	Bicyclo[2.1.1]hex-2-ene, 2-ethenyl-	C_8H_{10}	106	12.6	221369
51	5.44	83	2,4,6-Trimethyl-3-heptene	$C_{10}H_{20}$	140	36.9	113569
52	5.64	104	Styrene	C_8H_8	104	11.1	291542
53	5.77	43	Nonane	C_9H_{20}	128	38.9	228006
54	5.85	55	cis-2-Nonene	C_9H_{18}	126	16.5	113508
55	6.17	105	Benzene, (1-methylethyl)-	C_9H_{12}	120	40.6	228742
56	6.30	55	Cyclopentane, 1-methyl-3-(2-methylpropyl)-	$C_{10}H_{20}$	140	8.64	63333

57	6.53	67	Cycloheptene, 1,2-dimethyl-	C_9H_{16}	124	7.44	2342
58	6.61	57	2-Undecanethiol, 2-methyl-	$C_{12}H_{26}S$	202	12.3	47373
59	6.65	91	Benzene, propyl-	C_9H_{12}	120	60.0	113930
60	6.75	43	2-Nonen-1-ol, (Z)-	$C_9H_{18}O$	142	6.61	53342
61	6.80	43	Nonane, 2-methyl-	$C_{10}H_{22}$	142	6.98	3836
62	6.90	105	Benzene, 1,3,5-trimethyl-	C_9H_{12}	120	21.8	20469
63	7.05	105	Benzene, 1-ethyl-3-methyl-	C_9H_{12}	120	23.0	228743
64	7.10	118	α-Methylstyrene	C_9H_{10}	118	33.0	30236
65	7.25	41	1-Decene	$C_{10}H_{20}$	140	13.0	118883
66	7.32	105	Benzene, 1,2,3-trimethyl-	C_9H_{12}	120	15.5	228017
67	7.39	57	Decane	$C_{10}H_{22}$	142	38.4	114147
68	7.46	55	cis-3-Decene	$C_{10}H_{20}$	140	19.6	113558
69	7.50	43	Nonane, 2,6-dimethyl-	$C_{11}H_{24}$	156	10.5	61438
70	7.56	43	Octane, 3,3-dimethyl-	$C_{10}H_{22}$	142	6.86	61706
71	7.59	55	2-Decene, (Z)-	$C_{10}H_{20}$	140	8.99	114151
72	7.76	105	Benzene, 1-ethyl-3-methyl-	C_9H_{12}	120	12.8	228743
73	8.50	57	Decane, 3-methyl-	$C_{11}H_{24}$	156	12.7	113894
74	8.72	56	3-Undecene, (E)-	$C_{11}H_{22}$	154	5.72	60565
75	8.84	55	1-Undecene	$C_{11}H_{22}$	154	5.84	34717
76	8.90	41	3-Undecene, (Z)-	$C_{11}H_{22}$	154	9.17	142598
77	8.98	57	Undecane	$C_{11}H_{24}$	156	36.4	114185
78	9.03	55	3-Undecene, (Z)-	$C_{11}H_{22}$	154	12.0	142598
79	9.11	83	2,4-Pentadien-1-ol, 3-pentyl-, (2Z)-	$C_{10}H_{18}O$	154	23.8	142197
80	9.17	55	3-Undecene, (Z)-	$C_{11}H_{22}$	154	9.56	142598
81	9.23	55	1b,5,5,6a-Tetramethyl-octahydro-1-oxa-cyclopropa[a]inden-6-one	$C_{13}H_{20}O_2$	208	5.73	194131
82	10.24	56	Cyclopentane, 1-methyl-2-(4-methylpentyl)-, trans-	$C_{12}H_{24}$	168	7.57	113593
83	10.36	55	1-Dodecene	$C_{12}H_{24}$	168	6.41	107688
84	10.40	41	3-Dodecene, (E)-	$C_{12}H_{24}$	168	14.3	70642
85	10.49	57	Dodecane	$C_{12}H_{26}$	170	27.7	291499
86	10.54	55	6-Dodecene, (Z)-	$C_{12}H_{24}$	168	9.76	142611
87	11.39	43	2-Piperidinone, N-[4-bromo-n-butyl]-	$C_9H_{16}BrNO$	233	7.05	251632
88	11.68	55	7-Tetradecene	$C_{14}H_{28}$	196	4.51	70643
89	11.80	41	1-Tridecene	$C_{13}H_{26}$	182	11.1	107768
90	11.92	57	Tridecane	$C_{13}H_{28}$	184	25.7	114282
91	11.96	55	2-Tridecene, (Z)-	$C_{13}H_{26}$	182	4.59	142613
92	12.10	55	4-Tridecene, (Z)-	$C_{13}H_{26}$	182	7.47	142617
93	13.15	41	1-Tetradecene	$C_{14}H_{28}$	196	5.77	34720
94	13.27	57	Tetradecane	$C_{14}H_{30}$	198	36.1	113925
95	13.31	55	7-Tetradecene	$C_{14}H_{28}$	196	4.37	70643

96	13.44	41	3-Tetradecene, (E)-	$C_{14}H_{28}$	196	4.09	139981
97	14.44	55	1-Pentadecene	$C_{15}H_{30}$	210	7.60	232902
98	14.54	57	Pentadecane	$C_{15}H_{32}$	212	30.6	34728
99	14.58	55	E-2-Hexadecacen-1-ol	$C_{16}H_{32}O$	240	5.01	131101
100	14.73	55	Trichloroacetic acid, hexadecyl ester	$C_{18}H_{33}Cl_3O_2$	386	3.46	280518
101	15.65	55	1-Hexadecene	$C_{16}H_{32}$	224	7.42	118882
102	15.75	57	Hexadecane	$C_{16}H_{34}$	226	38.1	114191
103	15.78	55	Cyclopentane, undecyl-	$C_{16}H_{32}$	224	4.75	10583
104	16.47	92	Benzene, 1,1'-(1,3-propanediyl)bis-	$C_{15}H_{16}$	196	90.0	229725
105	16.55	57	2-Methyl-Z-4-tetradecene	$C_{15}H_{30}$	210	9.86	130783
106	16.81	43	3-Heptadecene, (Z)-	$C_{17}H_{34}$	238	8.13	141673
107	16.89	57	Heptadecane	$C_{17}H_{36}$	240	29.9	107308
108	16.93	55	2-Methyl-E-7-hexadecene	$C_{17}H_{34}$	238	7.19	130870
109	17.90	55	1-Nonadecene	$C_{19}H_{38}$	266	5.59	113626
110	17.99	57	Octadecane	$C_{18}H_{38}$	254	29.6	57273
111	18.16	55	1-Eicosene	$C_{20}H_{40}$	280	5.23	13488
112	19.02	57	Nonadecane	$C_{19}H_{40}$	268	17.5	114098
113	20.01	57	Eicosane	$C_{20}H_{42}$	282	28.6	290513
114	20.90	55	1-Docosene	$C_{22}H_{44}$	308	6.23	113878
115	20.97	57	Heneicosane	$C_{21}H_{44}$	296	27.8	107569
116	21.88	57	Heneicosane	$C_{21}H_{44}$	296	11.7	107569
117	22.76	57	Heneicosane	$C_{21}H_{44}$	296	12.8	107569
118	23.61	57	Heneicosane	$C_{21}H_{44}$	296	11.7	107569
119	24.43	57	Heneicosane	$C_{21}H_{44}$	296	10.3	107569
120	25.23	57	Octacosane	$C_{28}H_{58}$	394	9.22	134306
121	26.02	57	Octacosane	$C_{28}H_{58}$	394	9.32	134306
122	26.80	57	Octacosane	$C_{28}H_{58}$	394	12.0	134306

Construction waste plastic and household waste plastics mixture to crude fuel production process was thermal degradation without chemical adding. Liquid product was dark brown color, density is 0.78 g/ml and it is ignited with ignition source. Liquid crude fuel was analysis by GC/MS and chromatogram and compounds data table showed figure 5 and table 2. GC/MS Chromatogram compounds was analysis based on peak intensity, retention time, trace mass, molecular weight, compounds name, compounds probability percentage, and NIST library number. In this analysis compounds showed from GC/MS chromatogram C_3 to C_{28}. In this analysis result indicate that crude fuel has hydrocarbon including alkanes, alkenes and alkyl group compounds. Analysis result showed also halogenated content, nitrogen content, oxygen content, and alcoholic group present in the crude oil. Initial hydrocarbon compound is Propane (C_3H_8) (t=1.48, m/z=41) and probability percentage is 29.0%. Initial low carbon number compounds traced by GC/MS then carbon number are increased according to their boiling point wise. Basically GC/MS compounds detected low carbon number to higher carbon number based on retention time and traced mass. Large carbon number compound detected by GC/MS Octacosane ($C_{28}H_{58}$) (t=26.80, m/z=57) and probability percentage is 12.0%.

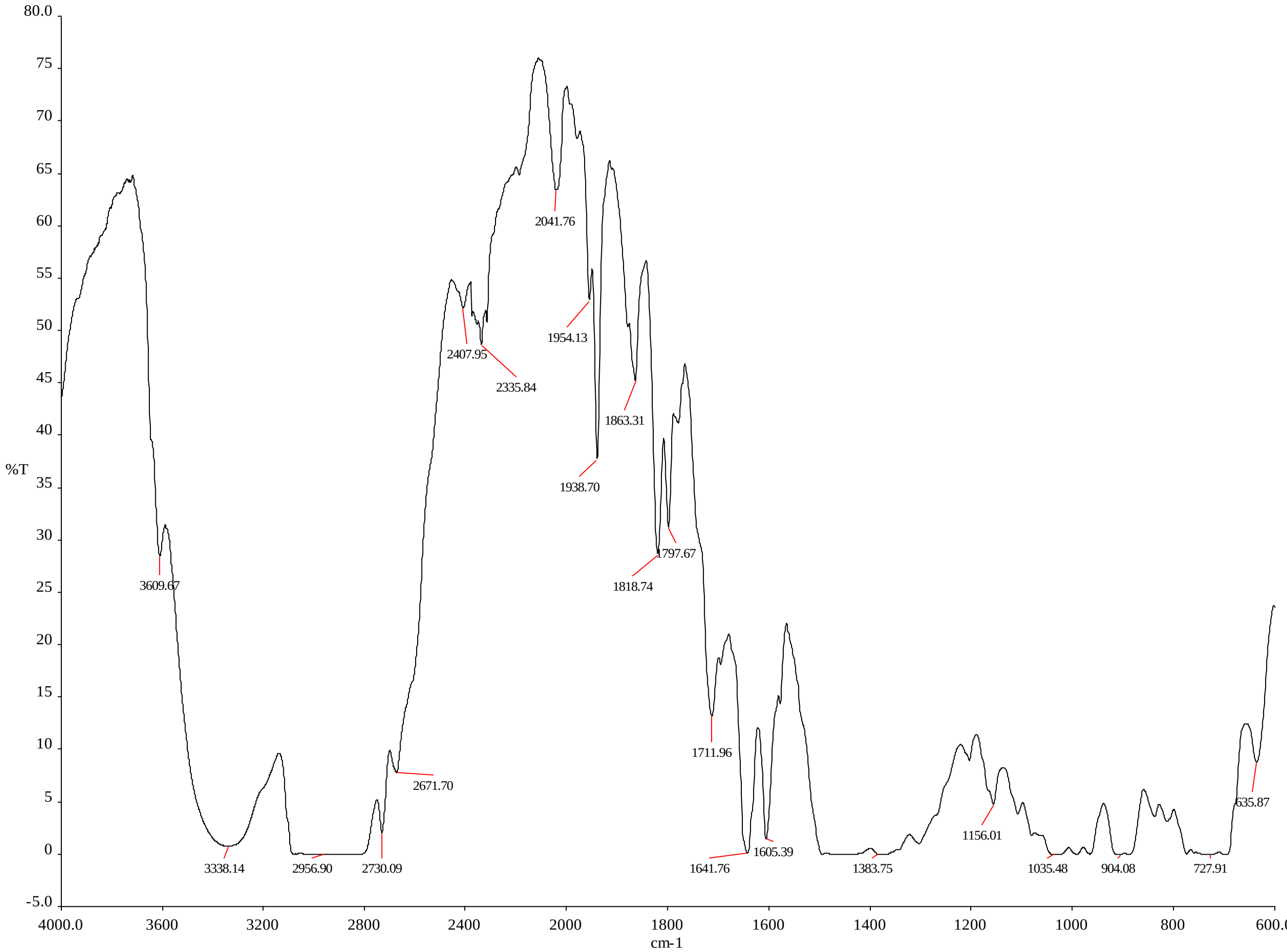

Figure 6: FTIR graph of waste plastic and construction plastic mixture to crude oil

Table 3: FTIR functional group of waste plastic and construction plastic mixture to crude oil

Number of Wave	Wave Number (cm^{-1})	Functional Group Name	Number of Wave	Wave Number (cm^{-1})	Functional Group Name
1	3609.67	Free OH	12	1711.95	Conjugated
2	3338.14	Intermolecular H Bonds	13	1641.76	Conjugated
3	2956.90	C-CH3	14	1605.39	Conjugated
4	2730.09	C-CH3	15	1383.75	CH3
5	2671.70	C-CH3	16	1156.01	C-OH Stretching Vibrations
6	2407.95	C= - N Stretching Vibrations	17	1035.48	Secondary Cyclic Alcohols

7	2441.76	C= - N Stretching Vibrations	18	904.08	-CH=CH2
8	1954.13	C=O Stretching Vibrations	19	727.91	-CH=CH- (cis)
9	1938.70	C=O Stretching Vibrations	20	635.87	N/A
10	1863.31	Nonconjugated	21		
11	1818.74	Nonconjugated	22		

Construction purposed used plastic (rubber types) and house hold used waste plastics mixture to crude fuel was analysis by FTIR to determine function group. Perkin Elmer spectrum 100 FTIR was use and spectrum and data table showed figure 6 and table 3. FTIR spectrum showed some functional group present in our produced crude fuel. Functional group are traced according to large number to small number such as Wave Number 3609.67 cm^{-1} functional group is Free OH, Wave Number 3338.14 cm^{-1} functional group is Intermolecular H Bonds, Wave Number 2956.90 cm^{-1} functional group is C-CH3, Wave Number 2730.09 cm^{-1} functional group is C-CH3, Wave Number 2671.70 cm^{-1} functional group is C-CH3, Wave Number 2407.95 and 2441.76 cm^{-1} functional group is C= - N Stretching Vibrations, Wave Number 1954.13 and 1938.70 cm^{-1} functional group is C=O Stretching Vibrations, Wave Number 1863.31 and 1818.74 cm^{-1} functional group is Nonconjugated, Wave Number 1711.95, 1641.76 and 1605.39 cm^{-1} functional group is Conjugated, Wave Number 1383.75 cm^{-1} functional group is CH3, Wave Number 1156.01 cm^{-1} functional group is C-OH Stretching Vibrations, Wave Number 1035.48 cm^{-1} functional group is Secondary Cyclic Alcohols, Wave Number 904.08 cm^{-1} functional group is -CH=CH2, Wave Number 727.91 cm^{-1} functional group is -CH=CH- (cis). Above all function group has different types of band energy which can calculate by using formula is E=hυ, Where h=Planks Constant, h =$6.626x10^{-34}$ J, υ= Frequency in Hertz (sec^{-1}), Where υ=c/λ, c=Speed of light, where, c=$3x10^{10}$ m/s, W=1/λ, where λ is wave length and W is wave number in cm^{-1}. Therefore the equation E=hυ, can substitute by the following equation, E=hcW.

Conclusion

Construction used plastic and a household used plastic to crude oil production was successfully in the laboratory scale batch process. Temperature was 300-420 ºC and sample was 50:50 ratios. Crude fuel color was brown and it ignites. World wide consumer are using plastic materials for daily activities and creating huge amount of waste plastics as garbage. Plastics are not biodegradable within short time and its take long time for degradable. If waste plastics long time setting in the land and it is creating big problem for environment. In this present technology can remove waste plastics problem from environment, and at the same time can produce valuable crude fuel energy for next generation. This crude fuel can use for refinery process to further modification.

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References

[1] Sasse, F.; Emig, G. Chemical Recycling of Polymer Materials. Chem. Eng. Technol. 1998, 21, 777.

[2] Kaminsky, W.; Hartmann, F. New Pathways in Plastics Recycling. Angew. Chem., Int. Ed. 2000, 39, 331.

[3] Scott, D. S.; Czernik, S. R.; Piskorz, J.; Radlein, A. G. Fast Pyrolysis of Plastic Wastes. Energy Fuels 1990, 4, 407.

[4] Kaminsky, W. Possibilities and Limits of Pyrolysis. Makromol. Chem., Macromol. Symp. 1992, 57, 145.

[5] Kaminsky, W.; Schlesselmann, B.; Simon, C. J. Olefins from Polyolefins and Mixed Plastics by Pyrolysis. J. Anal. Appl. Pyrolysis 1995, 32, 19.

[6] Conesa, J. A.; Font, R.; Marcilla, A.; Garci´a, A. N. Pyrolysis of Polyethylene in a Fluidized Bed Reactor. Energy Fuels 1994, 8, 1238.

[7] Conesa, J. A.; Font, R.; Marcilla, A. Comparison between the Pyrolysis of Types of Polyethylenes in a Fluidized Bed Reactor. Energy Fuels 1997, 11, 126.

[8] Williams, P. T.; Williams, E. A. Fluidized Bed Pyrolysis of Low Density Polyethylene to Produce Petrochemical Feedstock. J. Anal. Appl. Pyrolysis 1999, 51, 107.

[9] Mastral, F. J.; Esperanza, E.; Garci´a, P.; Juste, M. Pyrolysis of High-Density Polyethylene in a Fluidised Bed Reactor. Influence of the Temperature and Residence Time. J. Anal. Appl. Pyrolysis 2002, 63, 1.

[10] Jose´ M. Arandes,* Javier Eren˜ a, and Javier Bilbao, Valorization of Polyolefins Dissolved in Light Cycle Oil over HY Zeolites under Fluid Catalytic Cracking Unit Conditions, Ind. Eng. Chem. Res. 2003, 42, 3952-3961

[11] A Research Needs Assessment for Waste Plastics Recycling; DOE/ ER-30168, Vol. 2; December 1994.

[12] Stefan Czernik* and Richard J. French, Production of Hydrogen from Plastics by Pyrolysis and Catalytic Steam Reform, Energy & Fuels 2006, 20, 754-758

[13] Gupta, V. K.; Srivastava, S. K.; Mohan, D. Ind. Eng. Chem. Res. 1997, 36, 2207.

[14] Mohan, D.; Gupta, V. K.; Srivastava, S. K.; Chander, S. Colloids Surf., A 2001, 177, 169.

[15] Gupta, V. K.; Ali, I. J. Colloid Interface Sci. 2004, 271, 321.

[16] Gupta, V. K.; Sharma, S. Ind. Eng. Chem. Res. 2003, 42 (25), 6619.

[17] Gupta, V. K.; Mittal, A.; Gajbe, V. J. Colloid Interface Sci. 2005, 284 (1), 89.

[18] Gupta, V. K.; Ali, I.; Saini, V. K.; Van Gerven, T.; Van der Bruggen, B.; Vandecasteele, C. Ind. Eng. Chem. Res. 2005, 44 (10), 3655.

[19] Jain, A. K.; Gupta, V. K.; Bhatnagar, A.; Suhas. J. Hazard. Mater. 2003, 101 (1), 31.

[20] M. Ahmaruzzaman* and D. K. Sharma, Characterization of Liquid Products Obtained from Cocracking of Petroleum Vacuum Residue with Plastics, Energy & Fuels 2006, 20, 2498-2503