

# Investigation of Pyrolysis Kinetic Triplet, Thermodynamics, Product Characteristics and Reaction Mechanism of Waste Cooking Oil Biodiesel under the Influence of Copper Slag

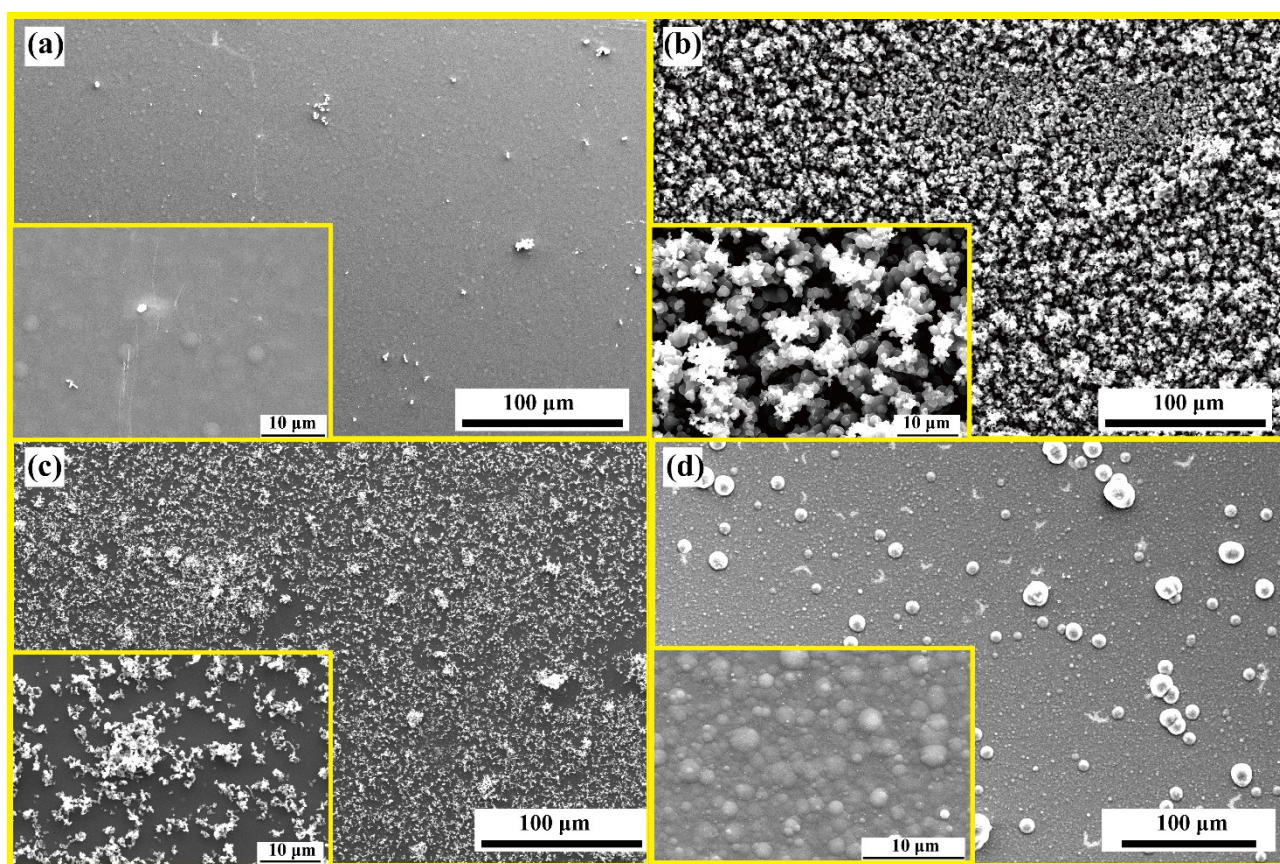
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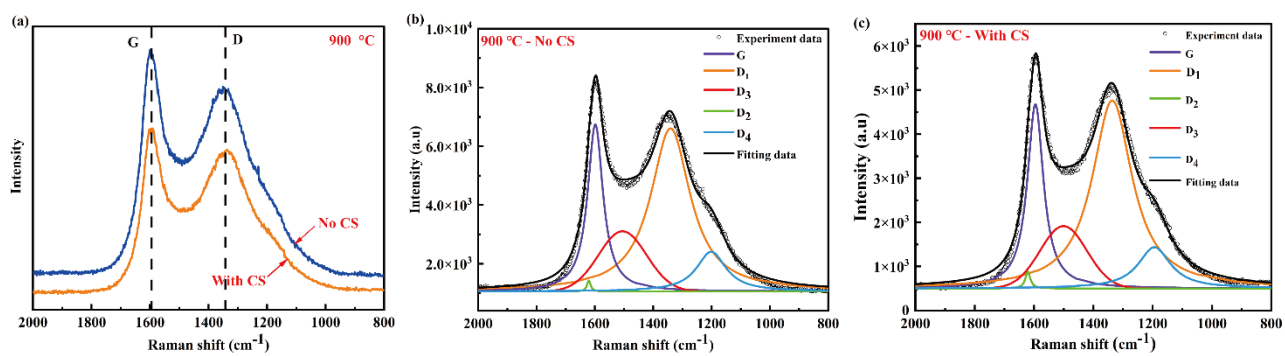
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**Figure S1.** SEM images of QTW-Coke and QCS-Coke at 900 °C: (a, b) no CS; (c, d) with CS.



**Figure S2.** Raman spectra and fitted bands of coke at 900 °C.

**Table S1.** Compounds of pure WCO-Biodiesel liquid products at different pyrolysis temperatures analyzed by GC-MS.

No.	Name of compound	Molecular formula	Relative concentration (peak area %)			
			600 °C	700 °C	800 °C	900 °C
<b>Oxygenated compounds (OCs)</b>			<b>39.28</b>	<b>9.69</b>	-	-
1	Acetic acid, methyl ester	C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>	0.57	-	-	-
2	2-Propenoic acid, methyl ester	C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>	2.14	0.13	-	-
3	4-Nonenoic acid, methyl ester	C <sub>10</sub> H <sub>18</sub> O <sub>2</sub>	0.56	-	-	-
4	Methyl 3-butenolate	C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>	1.68	-	-	-
5	2-Butenoic acid, methyl ester, (E)-	C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>	0.28	-	-	-
6	4-Pentenoic acid, methyl ester	C <sub>6</sub> H <sub>10</sub> O <sub>2</sub>	1.03	-	-	-
7	Camphenol, 6-	C <sub>10</sub> H <sub>16</sub> O	0.10	-	-	-
8	Cyclohexanemethanol, 4-methylene-	C <sub>8</sub> H <sub>14</sub> O	0.14	-	-	-
9	1,2-Dioxaspiro[4.5]decan-3-one, 4-methylene-	C <sub>9</sub> H <sub>12</sub> O <sub>3</sub>	0.17	-	-	-
10	5-Hexenoic acid, methyl ester	C <sub>7</sub> H <sub>12</sub> O <sub>2</sub>	0.72	-	-	-
11	Methyl trans-2-(3-cyclopropyl-7-norcaranyl)acetate	C <sub>13</sub> H <sub>20</sub> O <sub>2</sub>	0.10	-	-	-
12	6-Heptenoic acid, methyl ester	C <sub>8</sub> H <sub>14</sub> O <sub>2</sub>	3.01	-	-	-
13	Carveol	C <sub>10</sub> H <sub>16</sub> O	0.18	-	-	-
14	6-Heptynoic acid, methyl ester	C <sub>8</sub> H <sub>12</sub> O <sub>2</sub>	0.53	-	-	-
15	3-Octenoic acid, methyl ester, (Z)-	C <sub>9</sub> H <sub>16</sub> O <sub>2</sub>	1.11	-	-	-
16	4,7-Methano-1H-inden-1-ol, 3a,4,7,7a-tetrahydro-, acetate	C <sub>12</sub> H <sub>14</sub> O <sub>2</sub>	0.21	-	-	-
17	Bicyclo[2.2.1]hept-5-ene-2-carboxylic acid, methyl ester, endo-	C <sub>9</sub> H <sub>12</sub> O <sub>2</sub>	0.58	-	-	-
18	Methyl 5-norbornene-2-carboxylate	C <sub>9</sub> H <sub>12</sub> O <sub>2</sub>	1.57	-	-	-
19	8-Nonenoic acid, methyl ester	C <sub>10</sub> H <sub>18</sub> O <sub>2</sub>	1.49	-	-	-
20	4a,8a-Epoxy-naphthalene, 1,4,5,8-tetrahydro-	C <sub>10</sub> H <sub>12</sub> O	0.41	-	-	-
21	6-Propenylbicyclo[3.1.0]hexan-2-one	C <sub>9</sub> H <sub>12</sub> O	0.31	-	-	-
22	4-Decenoic acid, methyl ester	C <sub>11</sub> H <sub>20</sub> O <sub>2</sub>	1.09	-	-	-
23	9,12-Octadecadiynoic acid, methyl ester	C <sub>19</sub> H <sub>30</sub> O <sub>2</sub>	0.11	2.02	-	-
24	10-Undecenoic acid, methyl ester	C <sub>12</sub> H <sub>22</sub> O <sub>2</sub>	0.72	-	-	-
25	5,8,11-Heptadecatriynoic acid, methyl	C <sub>18</sub> H <sub>24</sub> O <sub>2</sub>	0.18	-	-	-
26	Cyclopropanenonanoic acid, methyl	C <sub>13</sub> H <sub>24</sub> O <sub>2</sub>	0.56	-	-	-
27	Cyclopropanenonanoic acid, methyl ester	C <sub>13</sub> H <sub>24</sub> O <sub>2</sub>	0.46	-	-	-
28	Methyl tetradecanoate	C <sub>15</sub> H <sub>30</sub> O <sub>2</sub>	0.28	-	-	-
29	Methyl myristoleate	C <sub>15</sub> H <sub>28</sub> O <sub>2</sub>	0.50	-	-	-
30	9-Octadecenoic acid (Z)-, methyl ester	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	0.31	-	-	-
31	Hexadecanoic acid, methyl ester	C <sub>17</sub> H <sub>34</sub> O <sub>2</sub>	12.58	1.69	-	-
32	11-Hexadecenoic acid, methyl ester	C <sub>17</sub> H <sub>32</sub> O <sub>2</sub>	0.23	-	-	-
33	8-Phenyl octanoic acid	C <sub>14</sub> H <sub>20</sub> O <sub>2</sub>	0.23	-	-	-
34	Methyl stearate	C <sub>19</sub> H <sub>38</sub> O <sub>2</sub>	4.53	-	-	-
35	9,12-Octadecadienoic acid (Z,Z)-, methyl ester	C <sub>19</sub> H <sub>34</sub> O <sub>2</sub>	0.50	5.74	-	-
36	14,17-Octadecadienoic acid, methyl ester	C <sub>19</sub> H <sub>34</sub> O <sub>2</sub>	0.10	-	-	-
37	9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-	C <sub>19</sub> H <sub>32</sub> O <sub>2</sub>	-	0.11	-	-
<b>Alkenes</b>			<b>15.22</b>	<b>0.43</b>	-	-
38	1-Pentene	C <sub>5</sub> H <sub>10</sub>	0.48	-	-	-
39	Cyclobutene, 3,3-dimethyl-	C <sub>6</sub> H <sub>10</sub>	0.30	-	-	-
40	1-Heptene	C <sub>7</sub> H <sub>14</sub>	2.09	-	-	-
41	Cyclohexene	C <sub>6</sub> H <sub>10</sub>	0.73	-	-	-
42	1,3-Cyclopentadiene, 1-methyl-	C <sub>6</sub> H <sub>8</sub>	0.79	-	-	-
43	Cyclohexene, 4-methyl-	C <sub>7</sub> H <sub>12</sub>	0.42	-	-	-
44	1-Octene	C <sub>8</sub> H <sub>16</sub>	1.34	-	-	-
45	1,3-Cyclopentadiene, 5,5-dimethyl-	C <sub>7</sub> H <sub>10</sub>	0.29	-	-	-
46	1,4-Cyclohexadiene, 1-methyl-	C <sub>7</sub> H <sub>10</sub>	0.36	-	-	-

47	4-Methyl-1,4-heptadiene	C <sub>8</sub> H <sub>14</sub>	0.16	-	-	-
48	1,3-Cycloheptadiene	C <sub>7</sub> H <sub>10</sub>	0.23	-	-	-
49	3-Methylenecyclohexene	C <sub>7</sub> H <sub>10</sub>	0.13	-	-	-
50	1-Nonene	C <sub>9</sub> H <sub>18</sub>	0.98	-	-	-
51	1,8-Nonadiene	C <sub>9</sub> H <sub>16</sub>	0.36	-	-	-
52	1-Decene	C <sub>10</sub> H <sub>20</sub>	0.80	-	-	-
53	1-Undecene	C <sub>11</sub> H <sub>22</sub>	0.89	-	-	-
54	1-Dodecene	C <sub>12</sub> H <sub>24</sub>	0.67	-	-	-
55	1,2-Bis(3-cyclohexenyl)ethylene	C <sub>14</sub> H <sub>20</sub>	0.28	-	-	-
52	Bicyclo[3.2.0]hept-2-ene, 2-methyl-	C <sub>8</sub> H <sub>12</sub>	1.02	-	-	-
53	1-Tridecene	C <sub>13</sub> H <sub>26</sub>	0.55	0.24	-	-
54	Bicyclo[3.2.0]hept-2-ene, 2-methyl-	C <sub>8</sub> H <sub>12</sub>	1.20	0.08	-	-
55	Bicyclo[6.4.0]dodeca-9,11-diene	C <sub>12</sub> H <sub>18</sub>	0.17	0.27	-	-
56	Bicyclo[2.2.1]hept-2-ene, 2,3-dimethyl-	C <sub>9</sub> H <sub>14</sub>	0.31	-	-	-
57	Cyclohexene, 5,6-diethenyl-1-methyl-	C <sub>11</sub> H <sub>16</sub>	0.54	-	-	-
58	Cetene	C <sub>16</sub> H <sub>32</sub>	0.15	-	-	-
59	1,3,5-Heptatriene, (E,E)-	C <sub>7</sub> H <sub>10</sub>	-	0.07	-	-
60	Cyclobuta[1,2:3,4]dicyclopentene, 1,3a,3b,6,6a,6b-hexahydro-	C <sub>10</sub> H <sub>12</sub>	-	0.09	-	-
61	Azulene	C <sub>10</sub> H <sub>8</sub>	-	0.26	-	-
<b>Alkanes</b>			<b>2.71</b>	<b>0.10</b>	-	-
61	Cyclopropane, 1-ethyl-2-methyl-, cis-	C <sub>6</sub> H <sub>12</sub>	2.09	-	-	-
62	Cyclopentane, methylene-	C <sub>6</sub> H <sub>10</sub>	0.62	-	-	-
63	Ethylidenecyclobutane	C <sub>6</sub> H <sub>10</sub>	-	0.10	-	-
<b>Monocyclic aromatic hydrocarbons (MAHs)</b>			<b>35.43</b>	<b>51.13</b>	<b>33.98</b>	<b>7.99</b>
64	Benzene	C <sub>6</sub> H <sub>6</sub>	7.19	10.08	3.09	3.21
65	Toluene	C <sub>7</sub> H <sub>8</sub>	8.50	11.30	3.12	-
66	Ethylbenzene	C <sub>8</sub> H <sub>10</sub>	2.03	1.21	0.42	-
67	Benzene, 1,3-dimethyl-	C <sub>8</sub> H <sub>10</sub>	2.08	4.20	-	-
68	o-Xylene	C <sub>8</sub> H <sub>10</sub>	1.38	-	-	-
69	Styrene	C <sub>8</sub> H <sub>8</sub>	2.61	8.14	11.93	-
70	Benzene, propyl-	C <sub>9</sub> H <sub>12</sub>	0.77	0.1	-	-
71	Benzene, 1-ethyl-4-methyl-	C <sub>9</sub> H <sub>12</sub>	1.42	0.06	-	-
72	Benzene, 1-ethyl-3-methyl-	C <sub>9</sub> H <sub>12</sub>	0.57	0.49	-	-
74	Mesitylene	C <sub>9</sub> H <sub>12</sub>	0.57	0.17	-	-
75	Methylstyrene	C <sub>9</sub> H <sub>10</sub>	0.31	0.28	-	-
76	Benzene, 1-ethenyl-2-methyl-	C <sub>9</sub> H <sub>10</sub>	0.77	-	0.85	-
77	Benzene, butyl-	C <sub>10</sub> H <sub>14</sub>	0.54	-	-	-
78	Benzene, 1-propenyl-	C <sub>9</sub> H <sub>10</sub>	0.67	-	-	0.27
79	Indane	C <sub>9</sub> H <sub>10</sub>	0.63	0.52	-	-
80	Indene	C <sub>9</sub> H <sub>8</sub>	1.95	4.60	6.44	-
81	Benzene, pentyl-	C <sub>11</sub> H <sub>16</sub>	0.39	-	-	-
82	Benzene, 1-methyl-2-(2-propenyl)-	C <sub>10</sub> H <sub>12</sub>	0.40	-	-	-
83	Benzene, 2-ethenyl-1,4-dimethyl-	C <sub>10</sub> H <sub>12</sub>	0.16	-	-	-
84	Cycloprop[a]indene, 1,1a,6,6a-tetrahydro-	C <sub>10</sub> H <sub>10</sub>	1.96	1.78	-	-
85	1H-Indene, 2,3-dimethyl-	C <sub>11</sub> H <sub>12</sub>	0.20	-	-	-
86	(1-Methylpenta-1,3-dienyl)benzene	C <sub>12</sub> H <sub>14</sub>	0.13	-	-	-
87	Biphenyl	C <sub>12</sub> H <sub>10</sub>	0.19	1.82	7.25	3.48
88	Benzene, 1-ethenyl-3-methyl-	C <sub>9</sub> H <sub>10</sub>	-	3.17	-	-
89	Benzene, 2-propenyl-	C <sub>9</sub> H <sub>10</sub>	-	0.92	-	-
90	Benzene, (2-methyl-1-propenyl)-	C <sub>10</sub> H <sub>12</sub>	-	0.12	-	-
91	Benzene, 4-ethenyl-1,2-dimethyl-	C <sub>10</sub> H <sub>12</sub>	-	0.13	-	-
92	Benzene, (1-methyl-2-cyclopropen-1-yl)-	C <sub>10</sub> H <sub>10</sub>	-	0.10	0.43	-
93	2-Methylindene	C <sub>10</sub> H <sub>10</sub>	-	0.88	-	-
94	1H-Indene, 1-ethylidene-	C <sub>11</sub> H <sub>10</sub>	-	0.17	-	1.03
95	1,1'-Biphenyl, 4-methyl-	C <sub>13</sub> H <sub>12</sub>	-	0.30	-	-
96	1,1'-Biphenyl, 2-methyl-	C <sub>13</sub> H <sub>12</sub>	-	0.44	-	-
97	1,1'-Biphenyl, 3-methyl-	C <sub>13</sub> H <sub>12</sub>	-	0.07	-	-

98	1H-Indene, 2-phenyl-	C <sub>15</sub> H <sub>12</sub>	-	0.09	-	-
99	Benzene, 1-methyl-4-(1-propynyl)-	C <sub>10</sub> H <sub>10</sub>	-	-	0.45	-
<b>Polycyclic aromatic hydrocarbons (PAHs)</b>			<b>7.37</b>	<b>38.65</b>	<b>66.02</b>	<b>92.01</b>
100	Naphthalene	C <sub>10</sub> H <sub>8</sub>	2.60	11.71	26.38	47.11
101	Naphthalene, 1,2-dihydro-3-methyl-	C <sub>11</sub> H <sub>12</sub>	0.62	-	-	-
102	Naphthalene, 2-methyl-	C <sub>11</sub> H <sub>10</sub>	1.48	6.23	6.40	-
103	Tricyclo[6.4.0.0(3,7)]dodeca-1,9,11-triene	C <sub>12</sub> H <sub>14</sub>	0.11	-	-	-
104	Naphthalene, 1-methyl-	C <sub>11</sub> H <sub>10</sub>	-	0.10	-	-
105	Naphthalene, 2-ethyl-	C <sub>12</sub> H <sub>12</sub>	0.12	0.09	-	-
106	Naphthalene, 1-ethyl-	C <sub>12</sub> H <sub>12</sub>	0.17	-	-	-
107	Naphthalene, 2,6-dimethyl-	C <sub>12</sub> H <sub>12</sub>	0.12	0.12	-	-
108	Naphthalene, 1,7-dimethyl-	C <sub>12</sub> H <sub>12</sub>	0.14	-	-	-
109	Acenaphthene	C <sub>12</sub> H <sub>10</sub>	0.13	0.43	1.06	0.79
110	Naphthalene, 2-ethenyl-	C <sub>12</sub> H <sub>10</sub>	0.15	0.57	4.78	-
111	Naphthalene, 1,8-dimethyl-	C <sub>12</sub> H <sub>12</sub>	0.12	-	-	-
112	Acenaphthylene	C <sub>12</sub> H <sub>8</sub>	0.39	2.75	-	10.11
113	Fluorene	C <sub>13</sub> H <sub>10</sub>	0.50	1.64	5.52	1.04
114	Phenanthrene	C <sub>14</sub> H <sub>10</sub>	0.25	2.03	4.82	11.98
115	Anthracene	C <sub>14</sub> H <sub>10</sub>	0.09	6.07	0.28	-
116	8,9-Dihydrocyclopenta[def]phenanthrene	C <sub>15</sub> H <sub>12</sub>	0.10	-	-	-
117	Benzo[k]fluoranthene	C <sub>20</sub> H <sub>12</sub>	0.12	-	-	1.24
118	Fluoranthene	C <sub>16</sub> H <sub>10</sub>	0.17	2.27	11.61	17.40
119	Naphthalene, 1,2-dihydro-2-methyl-	C <sub>11</sub> H <sub>12</sub>	-	0.06	-	-
120	Naphthalene, 1,2-dihydro-4-methyl-	C <sub>11</sub> H <sub>12</sub>	-	0.12	-	-
121	Naphthalene, 1,6-dimethyl-	C <sub>12</sub> H <sub>12</sub>	-	0.17	-	-
122	Naphthalene, 1,3-dimethyl-	C <sub>12</sub> H <sub>12</sub>	-	0.29	-	-
123	1-Isopropenyl-naphthalene	C <sub>13</sub> H <sub>12</sub>	-	0.09	-	-
124	Naphthalene, 1-(2-propenyl)-	C <sub>13</sub> H <sub>12</sub>	-	0.28	-	-
125	9H-Fluorene, 9-methyl-	C <sub>14</sub> H <sub>12</sub>	-	0.45	-	-
126	9H-Fluorene, 1-methyl-	C <sub>14</sub> H <sub>12</sub>	-	0.32	0.66	-
128	Anthracene, 9,10-dihydro-	C <sub>14</sub> H <sub>12</sub>	-	0.06	-	-
129	1H-Indene, 2-phenyl-	C <sub>15</sub> H <sub>12</sub>	-	0.09	-	-
130	Anthracene, 2-methyl-	C <sub>15</sub> H <sub>12</sub>	-	0.20	-	-
131	Phenanthrene, 2-methyl-	C <sub>15</sub> H <sub>12</sub>	-	0.91	-	-
132	4H-Cyclopenta[def]phenanthrene	C <sub>15</sub> H <sub>10</sub>	-	0.32	1.25	0.53
133	Naphthalene, 2-phenyl-	C <sub>16</sub> H <sub>12</sub>	-	0.38	1.66	1.23
134	Tricyclo[8.2.2.2(4,7)]hexadeca-2,4,6,8,10,12,13,15-octaene	C <sub>16</sub> H <sub>12</sub>	-	0.06	-	-
135	Naphthalene, 1,8-di-1-propynyl-	C <sub>16</sub> H <sub>12</sub>	-	0.15	-	-
136	5,16[1',2']:8,13[1'',2'']-Dibenzenodibenzo[a,g]cyclododecene, 6,7,14,15-tetrahydro-	C <sub>32</sub> H <sub>24</sub>	-	0.08	-	-
137	Pyrene, 4,5-dihydro-	C <sub>16</sub> H <sub>12</sub>	-	0.19	-	-
138	Pyrene, 1-methyl-	C <sub>17</sub> H <sub>12</sub>	-	0.13	-	-
139	11H-Benzo[a]fluorene	C <sub>17</sub> H <sub>12</sub>	-	0.31	-	-
140	Naphthalene, 1-phenyl-	C <sub>16</sub> H <sub>12</sub>	-	-	1.26	-
141	Pyrene, 4-methyl-	C <sub>17</sub> H <sub>12</sub>	-	-	0.32	-
142	1,4-Ethenoanthracene, 1,4-dihydro-	C <sub>16</sub> H <sub>12</sub>	-	-	-	0.58

**Table S2.** Compounds of WCO-biodiesel in liquid products under the influence of CS at different pyrolysis temperatures were analyzed by GC-MS.

No.	Name of compound	Molecular formula	Relative concentration (peak area %)			
			600 °C	700 °C	800 °C	900 °C
Oxygenated compounds (OCs)			40.63	7.06	-	-
1	Cyclobutanone, 2,2,3-trimethyl-	C <sub>7</sub> H <sub>12</sub> O	1.48	-	-	-
2	4-Hexen-1-ol, (Z)-	C <sub>6</sub> H <sub>12</sub> O	0.29	-	-	-
3	2-Propenoic acid, methyl ester	C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>	3.02	-	-	-
4	Acetic acid, methyl ester	C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>	0.87	-	-	-
5	4-Nonenoic acid, methyl ester	C <sub>10</sub> H <sub>18</sub> O <sub>2</sub>	0.76	-	-	-
6	Methyl 3-butenolate	C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>	2.18	-	-	-
7	3-Oxabicyclo[4.3.0]non-8-en-2-one, cis-	C <sub>8</sub> H <sub>10</sub> O <sub>2</sub>	0.28	-	-	-
8	Methanone, dicyclopropyl-	C <sub>7</sub> H <sub>10</sub> O	0.33	-	-	-
9	4-Pentenoic acid, methyl ester	C <sub>6</sub> H <sub>10</sub> O <sub>2</sub>	1.31	-	-	-
10	5-Hexenoic acid, methyl ester	C <sub>7</sub> H <sub>12</sub> O <sub>2</sub>	0.75	-	-	-
11	6-Heptenoic acid, methyl ester	C <sub>8</sub> H <sub>14</sub> O <sub>2</sub>	2.89	-	-	-
12	Cyclopentanol, 3-(carbmethoxy)methyl-	C <sub>8</sub> H <sub>14</sub> O <sub>3</sub>	0.46	-	-	-
13	3-Octenoic acid, methyl ester, (Z)-	C <sub>9</sub> H <sub>16</sub> O <sub>2</sub>	0.98	-	-	-
14	1-Methylbicyclo[2.2.1]hept-5-ene-2-carboxylic acid, 4,4-dimethyl-2-oxotetrahydrofuran-3-yl ester	C <sub>15</sub> H <sub>20</sub> O <sub>4</sub>	0.18	-	-	-
15	Methyl 5-norbornene-2-carboxylate	C <sub>9</sub> H <sub>12</sub> O <sub>2</sub>	1.85	-	-	-
16	8-Nonenoic acid, methyl ester	C <sub>10</sub> H <sub>18</sub> O <sub>2</sub>	1.25	-	-	-
17	1,7-Dimethyl-4-oxa-tricyclo[5.2.1.0(2,6)]decane-3,5,8-trione	C <sub>11</sub> H <sub>12</sub> O <sub>4</sub>	0.28	-	-	-
18	6-Propenylbicyclo[3.1.0]hexan-2-one	C <sub>9</sub> H <sub>12</sub> O	0.23	-	-	-
19	4-Decenoic acid, methyl ester	C <sub>11</sub> H <sub>20</sub> O <sub>2</sub>	0.80	-	-	-
20	10-Undecenoic acid, methyl ester	C <sub>12</sub> H <sub>22</sub> O <sub>2</sub>	0.53	-	-	-
21	Cyclopropanenonanoic acid, methyl ester	C <sub>13</sub> H <sub>24</sub> O <sub>2</sub>	0.89	-	-	-
22	Methyl tetradecanoate	C <sub>15</sub> H <sub>30</sub> O <sub>2</sub>	0.26	-	-	-
23	Methyl myristoleate	C <sub>15</sub> H <sub>28</sub> O <sub>2</sub>	0.48	-	-	-
24	9-Octadecenoic acid (Z)-, methyl ester	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	0.13	-	-	-
25	2-Benzylcyclohexanone	C <sub>13</sub> H <sub>16</sub> O	0.12	-	-	-
26	9-Hexadecenoic acid, methyl ester, (Z)-	C <sub>17</sub> H <sub>32</sub> O <sub>2</sub>	0.19	-	-	-
27	Hexadecanoic acid, methyl ester	C <sub>17</sub> H <sub>34</sub> O <sub>2</sub>	12.08	1.75	-	-
28	8-Phenyl octanoic acid	C <sub>14</sub> H <sub>20</sub> O <sub>2</sub>	0.21	-	-	-
29	Methyl stearate	C <sub>19</sub> H <sub>38</sub> O <sub>2</sub>	4.81	-	-	-
30	9,12-Octadecadienoic acid (Z,Z)-,	C <sub>19</sub> H <sub>34</sub> O <sub>2</sub>	0.76	2.09	-	-
31	2-Propenoic acid, methyl ester	C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>	-	0.13	-	-
32	9-Octadecenoic acid, methyl ester, (E)-	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	-	2.98	-	-
33	9,12,15-Octadecatrienoic acid, methyl	C <sub>19</sub> H <sub>32</sub> O <sub>2</sub>	-	0.11	-	-
Alkenes			16.25	0.59	-	-
34	1,3-Pentadiene, 3-methyl-, (E)-	C <sub>4</sub> H <sub>8</sub>	0.90	-	-	-
35	1-Heptene	C <sub>6</sub> H <sub>10</sub>	0.47	-	-	-
36	1,3-Cyclopentadiene, 1-methyl-	C <sub>7</sub> H <sub>14</sub>	2.96	-	-	-
37	Cyclohexene, 4-methyl-	C <sub>6</sub> H <sub>8</sub>	1.11	-	-	-
38	1-Octene	C <sub>7</sub> H <sub>12</sub>	0.55	-	-	-
39	1,4-Cyclohexadiene, 1-methyl-	C <sub>8</sub> H <sub>16</sub>	1.76	-	-	-
40	1-Methylcyclohexa-2,4-diene	C <sub>7</sub> H <sub>10</sub>	0.33	-	-	-
41	1,6-Octadiene, 3,7-dimethyl-	C <sub>7</sub> H <sub>10</sub>	0.48	-	-	-
42	1-Nonene	C <sub>10</sub> H <sub>18</sub>	0.19	-	-	-
43	1,8-Nonadiene	C <sub>9</sub> H <sub>18</sub>	1.20	-	-	-
44	1-Decene	C <sub>9</sub> H <sub>16</sub>	0.40	-	-	-
45	1-Undecene	C <sub>10</sub> H <sub>20</sub>	0.87	-	-	-
46	1-Dodecene	C <sub>11</sub> H <sub>22</sub>	0.89	-	-	-

47	Bicyclo[3.2.0]hept-2-ene, 2-methyl-	C <sub>12</sub> H <sub>24</sub>	0.56	-	-	-
48	1-Tridecene	C <sub>8</sub> H <sub>12</sub>	1.86	-	-	-
49	Bicyclo[2.2.1]hept-2-ene, 2,3-dimethyl-	C <sub>9</sub> H <sub>14</sub>	0.18	-	-	-
50	1-Tetradecene	C <sub>14</sub> H <sub>28</sub>	0.58	-	-	-
51	Cyclohexene, 5,6-diethenyl-1-methyl-	C <sub>11</sub> H <sub>16</sub>	0.40	-	-	-
52	Cetene	C <sub>16</sub> H <sub>32</sub>	0.12	-	-	-
53	3-Penten-1-yne, 3-methyl-	C <sub>6</sub> H <sub>8</sub>	-	0.24	-	-
54	1,3,5-Heptatriene, (E,E)-	C <sub>7</sub> H <sub>10</sub>	-	0.08	-	-
55	Azulene	C <sub>10</sub> H <sub>8</sub>	-	0.27	-	-
<b>Alkanes</b>			<b>5.04</b>	<b>0.19</b>	-	-
56	Cyclopropane, 1-ethyl-2-methyl-, cis-	C <sub>6</sub> H <sub>12</sub>	3.85	-	-	-
57	Cyclopentane, methylene-	C <sub>6</sub> H <sub>10</sub>	1.05	-	-	-
58	Cyclopentadecane	C <sub>15</sub> H <sub>30</sub>	0.15	-	-	-
59	Ethylidenecyclobutane	C <sub>6</sub> H <sub>10</sub>	-	0.10	-	-
60	Cyclobuta[1,2:3,4]dicyclopentene, 1,3a,3b,6,6a,6b-hexahydro-	C <sub>10</sub> H <sub>12</sub>	-	0.09	-	-
<b>Monocyclic aromatic hydrocarbons (MAHs)</b>			<b>35.97</b>	<b>53.13</b>	<b>15.76</b>	<b>5.73</b>
61	Benzene	C <sub>6</sub> H <sub>6</sub>	9.35	10.44		0.69
62	Toluene	C <sub>7</sub> H <sub>8</sub>	10.07	11.70		
63	Ethylbenzene	C <sub>8</sub> H <sub>10</sub>	2.29	1.25		
64	p-Xylene	C <sub>8</sub> H <sub>10</sub>	2.27	-		
65	o-Xylene	C <sub>8</sub> H <sub>10</sub>	1.46	-		
66	Styrene	C <sub>8</sub> H <sub>8</sub>	2.23	8.43	4.65	
67	Benzene, propyl-	C <sub>9</sub> H <sub>12</sub>	0.73	0.10		
68	Benzene, 1-ethyl-3-methyl-	C <sub>9</sub> H <sub>12</sub>	1.45	0.51		
69	Benzene, (1-methylethyl)-	C <sub>9</sub> H <sub>12</sub>	0.51	-		
70	Methylstyrene	C <sub>9</sub> H <sub>10</sub>	0.21	0.29		
71	Benzene, 2-propenyl-	C <sub>9</sub> H <sub>10</sub>	1.03	0.96		
72	Benzene, butyl-	C <sub>10</sub> H <sub>14</sub>	0.46	-		
73	Indane	C <sub>9</sub> H <sub>10</sub>	1.81	0.54		
74	Benzene, pentyl-	C <sub>11</sub> H <sub>16</sub>	0.29	-		
75	Benzene, 1-methyl-4-(2-propenyl)-	C <sub>10</sub> H <sub>12</sub>	0.19	-		
76	2-Methylindene	C <sub>10</sub> H <sub>10</sub>	1.37	-		
77	Cycloprop[a]indene, 1,1a,6,6a-tetrahydro-	C <sub>10</sub> H <sub>10</sub>	0.24	1.85		
78	Benzene, 1,3-dimethyl-	C <sub>8</sub> H <sub>10</sub>	-	3.70		
79	Benzene, 1-ethyl-4-methyl-	C <sub>9</sub> H <sub>12</sub>	-	0.06		
80	Mesitylene	C <sub>9</sub> H <sub>12</sub>	-	0.17		
81	Benzene, 1-ethenyl-3-methyl-	C <sub>9</sub> H <sub>10</sub>	-	3.29		
82	Indene	C <sub>9</sub> H <sub>8</sub>	-	4.76	3.88	0.66
83	Benzene, (2-methyl-1-propenyl)-	C <sub>10</sub> H <sub>12</sub>	-	0.12		
84	Benzene, 4-ethenyl-1,2-dimethyl-	C <sub>10</sub> H <sub>12</sub>	-	0.14		
85	Benzene, (1-methyl-2-cyclopropen-1-yl)-	C <sub>10</sub> H <sub>10</sub>	-	0.10		
86	Benzene, 1,3-diethenyl-	C <sub>10</sub> H <sub>10</sub>	-	0.91		
87	2-Methylindene	C <sub>10</sub> H <sub>10</sub>	-	0.06		
88	Naphthalene, 1,2-dihydro-2-methyl-	C <sub>11</sub> H <sub>12</sub>	-	0.12		
89	Naphthalene, 1,2-dihydro-4-methyl-	C <sub>11</sub> H <sub>12</sub>	-	0.25		
90	1H-Indene, 1-ethylidene-	C <sub>11</sub> H <sub>10</sub>	-	1.88		1.15
91	Biphenyl	C <sub>12</sub> H <sub>10</sub>	-	0.31	7.22	3.24
92	1,1'-Biphenyl, 4-methyl-	C <sub>13</sub> H <sub>12</sub>	-	0.45	-	-
93	1,1'-Biphenyl, 2-methyl-	C <sub>13</sub> H <sub>12</sub>	-	0.07	-	-
94	1,1'-Biphenyl, 3-methyl-	C <sub>13</sub> H <sub>12</sub>	-	0.91	-	-
<b>Polycyclic aromatic hydrocarbons (PAHs)</b>			<b>2.11</b>	<b>39.02</b>	<b>84.24</b>	<b>94.27</b>
95	Naphthalene	C <sub>10</sub> H <sub>8</sub>	0.99	12.13	46.72	52.61
96	Naphthalene, 1-methyl-	C <sub>11</sub> H <sub>10</sub>	0.41	0.10	4.09	-
97	Naphthalene, 2-methyl-	C <sub>11</sub> H <sub>10</sub>	0.42	6.46	-	9.67
98	Acenaphthylene	C <sub>12</sub> H <sub>8</sub>	0.12	2.85	8.11	-
99	Fluorene	C <sub>13</sub> H <sub>10</sub>	0.16	3.53	2.65	0.89



100	Naphthalene, 2-ethyl-	C <sub>12</sub> H <sub>12</sub>	-	0.10	-	-
101	Naphthalene, 1,6-dimethyl-	C <sub>12</sub> H <sub>12</sub>	-	0.17	-	-
102	Naphthalene, 1,3-dimethyl-	C <sub>12</sub> H <sub>12</sub>	-	0.30	-	-
103	Naphthalene, 2-ethenyl-	C <sub>12</sub> H <sub>10</sub>	-	2.13	-	-
104	Naphthalene, 2,6-dimethyl-	C <sub>12</sub> H <sub>12</sub>	-	0.13	-	-
105	1-Isopropenyl naphthalene	C <sub>13</sub> H <sub>12</sub>	-	0.10	-	-
106	Acenaphthene	C <sub>12</sub> H <sub>10</sub>	-	0.44	-	0.62
107	Naphthalene, 1-(2-propenyl)-	C <sub>13</sub> H <sub>12</sub>	-	0.29	0.97	-
108	9H-Fluorene, 9-methyl-	C <sub>14</sub> H <sub>12</sub>	-	0.44	-	-
109	9H-Fluorene, 1-methyl-	C <sub>14</sub> H <sub>12</sub>	-	0.29	-	-
110	Anthracene, 9,10-dihydro-	C <sub>14</sub> H <sub>12</sub>	-	0.46	-	-
111	1H-Indene, 2-phenyl-	C <sub>15</sub> H <sub>12</sub>	-	0.33	-	-
112	Anthracene	C <sub>14</sub> H <sub>10</sub>	-	0.06	-	-
113	Phenanthrene	C <sub>14</sub> H <sub>10</sub>	-	0.09	12.66	14.31
114	Pyrene	C <sub>16</sub> H <sub>10</sub>	-	-	4.87	-
115	Phenanthrene, 2-methyl-	C <sub>15</sub> H <sub>12</sub>	-	3.14	-	-
116	Anthracene, 2-methyl-	C <sub>15</sub> H <sub>12</sub>	-	1.05	-	-
117	4H-Cyclopenta[def]phenanthrene	C <sub>15</sub> H <sub>10</sub>	-	0.94	0.83	-
118	Naphthalene, 2-phenyl-	C <sub>16</sub> H <sub>12</sub>	-	0.20	-	-
119	Tricyclo[8.2.2.2(4,7)]hexadeca-2,4,6,8,10,12,13,15-octaene	C <sub>16</sub> H <sub>12</sub>	-	0.33	-	-
120	Naphthalene, 1,8-di-1-propynyl-	C <sub>16</sub> H <sub>12</sub>	-	0.39	-	-
121	5,16[1',2']:8,13[1'',2'']-Dibenzonodibenzo[a,g]cyclododecene, 6,7,14,15-tetrahydro-	C <sub>32</sub> H <sub>24</sub>	-	0.06	-	-
122	Fluoranthene	C <sub>16</sub> H <sub>10</sub>	-	0.16	2.49	15.64
123	Pyrene, 4,5-dihydro-	C <sub>16</sub> H <sub>12</sub>	-	0.08	-	-
124	Pyrene, 1-methyl-	C <sub>17</sub> H <sub>12</sub>	-	2.35	-	-
125	11H-Benzo[a]fluorene	C <sub>17</sub> H <sub>12</sub>	-	0.20	-	-
126	11H-Benzo[b]fluorene	C <sub>17</sub> H <sub>12</sub>	-	0.13	-	-
127	1,4-Ethenoanthracene, 1,4-dihydro-	C <sub>16</sub> H <sub>12</sub>	-	-	-	0.53