Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Interactions in co-pyrolysis of *Salicornia bigelovii* and heavy fuel oil

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Supplementary Material

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Table S1.Typical reaction mechanisms for solid-state reactions. Reproduced with permission fromZhao et al., Polymers; published by MDPI, 2020.

No.	$g(\alpha)$	$f(\alpha)$	Rate determining mechanism
1. Chemical process or mechanism non-invoking equations			
1	$1-(1-\alpha)^{\frac{2}{3}}$	$3/2(1-\alpha)^{1/3}$	Chemical reaction
2	$1-(1-\alpha)^{\frac{1}{4}}$	$4(1-\alpha)^{3/4}$	Chemical reaction
3	$(1-\alpha)^{\frac{-1}{2}}-1$	$2(1-\alpha)^{3/2}$	Chemical reaction
4	$(1-\alpha)^{-1}-1$	$(1-\alpha)^{2}$	Chemical reaction
5	$(1-\alpha)^{-2}-1$	$1/2(1-\alpha)^{3}$	Chemical reaction
6	$(1-\alpha)^{-3}-1$	$1/3(1-\alpha)^{4}$	Chemical reaction
7	$1-(1-\alpha)^{2}$	$1/2(1-\alpha)$	Chemical reaction
8	$1-(1-\alpha)^{3}$	$1/3(1-\alpha)^{2}$	Chemical reaction
9	$1-(1-\alpha)^{4}$	$1/4(1-\alpha)^{3}$	Chemical reaction
2. Acceleratory rate equations			
10	$\alpha^{3/2}$	$2/3\alpha^{-1/2}$	Nucleation
11	$\alpha^{1/2}$	$2\alpha^{1/2}$	Nucleation
12	$\alpha^{1/3}$	$3\alpha^{2/3}$	Nucleation
13	$\alpha^{1/4}$	$4\alpha^{3/4}$	Nucleation
14	$\ln\alpha$	α	Nucleation
3. Sigmoidal rate equations or random nucleation and subsequent growth			
15	$-ln(1-\alpha)$	$1-\alpha$	Assumed random nucleation and subsequent growth
16	$[-\ln(1-\alpha)]^{2/3}$	$3/2(1-\alpha)[-\ln(1-\alpha)]^{1/3}$	Assumed random nucleation and subsequent growth
17	$[-\ln(1-\alpha)]^{1/2}$	$2(1-\alpha)[-\ln(1-\alpha)]^{1/2}$	Assumed random nucleation and subsequent growth
18	$[-\ln(1-\alpha)]^{1/3}$	$3(1-\alpha)[-\ln(1-\alpha)]^{2/3}$	Assumed random nucleation and subsequent growth
19	$[-\ln(1-\alpha)]^{1/4}$	$4(1-\alpha)[-\ln(1-\alpha)]^{3/4}$	Assumed random nucleation and subsequent growth
20	$[-\ln(1-\alpha)]^{2}$	$1/2(1-\alpha)[-\ln(1-\alpha)]^{-1}$	Assumed random nucleation and subsequent growth
21	$[-\ln(1-\alpha)]^{3}$	$1/3(1-\alpha)[-\ln(1-\alpha)]^{-2}$	Assumed random nucleation and subsequent growth
22	$[-\ln(1-\alpha)]^{4}$	$1/4(1-\alpha)[-\ln(1-\alpha)]^{-3}$	Assumed random nucleation and subsequent growth
23	$ln\,\alpha/(1-\alpha)$	$\alpha/(1-\alpha)$	Branching nuclei
4. Deceleratory rate equations			
4.1. Phase boundary reaction			
24	α	$(1-\alpha)^{0}$	Contracting disk
25	$1-(1-\alpha)^{1/2}$	$2(1-\alpha)^{1/2}$	Contracting cylinder (cylindrical symmetry)
26	$1-(1-\alpha)^{1/3}$	$3(1-\alpha)^{2/3}$	Contracting sphere (Spherical symmetry)
4.2. Based on the diffusion mechanism			
27	α^{2}	$1/(2\alpha)$	One-dimensional diffusion
28	$\left[1-(1-\alpha)^{1/2}\right]^{1/2}$	$4(1-\alpha)[1-(1-\alpha)^{1/2}]^{1/2}$	Two-dimensional diffusion
29	$\alpha+(1-\alpha)\,ln(1-\alpha)$	$[-ln(1-\alpha)]^{-1}$	Two-dimensional diffusion
30	$[-\ln(1-\alpha)^{1/3}]^{2}$	$3/2(1-\alpha)^{2/3}[1-(1-\alpha)^{1/3}]^{-1}$	Three-dimensional diffusion, spherical symmetry
31	$1-2/3\alpha-(1-\alpha)^{2/3}$	$3/2[(1-\alpha)^{-\frac{1}{3}}-1]^{-1}$	Three-dimensional diffusion, cylindrical symmetry
32	$\left[(1-\alpha)^{-1/3}-1\right]^{2}$	$3/2(1-\alpha)^{4/3}[(1-\alpha)^{-1/3}-1]^{-1}$	Three-dimensional diffusion
33	$\left[(1+\alpha)^{1/3}-1\right]^{2}$	$3/2(1+\alpha)^{2/3}[(1+\alpha)^{-1/3}-1]^{-1}$	Three-dimensional diffusion
34	$1+2/3\alpha-(1+\alpha)^{2/3}$	$3/2[(1+\alpha)^{-1/3}-1]^{-1}$	Three-dimensional diffusion
35	$\left[(1+\alpha)^{-1/3}-1\right]^{2}$	$3/2(1+\alpha)^{4/3}[(1+\alpha)^{-1/3}-1]^{-1}$	Three-dimensional diffusion
36	$\left[1-(1+\alpha)^{1/3}\right]^{1/2}$	$6(1-\alpha)^{2/3}[1-(1-\alpha)^{1/3}]^{1/2}$	Three-dimensional diffusion

Table S2. GC/MS of bio-oil from the pyrolysis of SB with HFO.

	SB	25% HFO	50% HFO	75% HFO	100% HFO
Alkanes					
Tetradecane	0.16	0.75	1.52	3.80	2.04
Pentadecane	0.48	0.85	1.56	2.76	3.51
Hexadecane	0.22	2.31	3.38	4.92	4.54
Tridecane	0.17	0.95	1.08	1.72	2.48
Cyclotridecane	0.27	0.12			
Octadecane	0.34	6.40	0.99	1.76	1.46
Cyclopentadecane	0.27	0.12		0.44	
Nonadecane	0.31	0.71	0.98	0.43	
Heptadecane	0.45	2.56	2.80	4.44	2.55
Decane		0.25	0.39	0.46	0.50
Undecane	0.05	0.34	0.63	0.70	0.68
Dodecane	0.16	0.65	1.56	2.30	1.17
Cyclododecane			0.37		
Eicosane	1.19	2.50	5.75	11.75	10.44
Cyclohexadecane			0.26		
Dodecane, 2,6,10-trimethyl-		0.18	1.01	1.38	1.16
Cyclododecane, ethyl-	0.35	0.16			
Cyclohexane, 1,2-dimethyl-3-pentyl-4-propyl-	0.51				
Nonane		0.04	0.25	0.06	0.08
Decane, 3-methyl-		0.04			0.09
Hexadecane, 2,6,10,14-tetramethyl-		0.22			
Decane, 2-methyl-		0.12	0.35	0.30	
2-methyltetracosane		0.23			
Hexatriacontane		0.08			
Hexacosane		0.25	0.38		
Hentriacontane		0.32	0.26		
Cyclotetradecane		1.03	0.08		0.30
Octacosane			0.63		
Heneicosane		1.04	1.03	1.60	1.48
Nonane, 2,6-dimethyl-			0.06		
Cyclopentane, pentyl-			0.08		
Undecane, 3,4-dimethyl-			0.08		
Decane, 3,8-dimethyl-			0.18		
Dodecane, 4-methyl-			0.24	0.29	0.23
Tetracontane, 3,5,24-trimethyl-				0.24	
Heptacosane			0.40		
Dodecane, 3-methyl-		0.16			
Hexadecane, 2-methyl-			0.10	0.49	

Tetracosane			1.13		0.97
Dodecane, 2-methyl-			0.38		0.45
Heptane, 3-ethyl-				0.05	
Undecane, 3-methyl-				0.17	0.16
2,3-Dimethyldodecane				0.17	
Tridecane, 2-methyl-				0.36	1.05
D-Homoandrostane, (5.alpha.,13.alpha.)-				0.71	
Tricosane				0.20	
Nonane, 4-methyl-					0.06
Nonane, 2-methyl-					0.03
Octane, 3,3-dimethyl-					0.07
Cyclohexane, butyl-					0.10
Hexadecane, 2,6,11,15-tetramethyl-					0.30
Cyclodecane					0.23
Tridecane, 4-methyl-					0.17
10-Methylnonadecane					0.41
Heneicosane, 3-methyl-					0.30
4,4'-Bis(tetrahydrothiopyran)					0.26
7-Cyclohexylnonadecane					0.98
Alkenes					
1-Decene		0.07	0.09	0.10	0.12
1-Dodecene	0.45	0.19	0.24	0.23	
1-Tridecene		0.22	0.40	0.40	0.43
2-Tetradecene, (E)-		0.26			
8-Heptadecene	1.38	1.29	0.54		
1-Heptadecene		0.31		0.71	0.56
1,9-Tetradecadiene	0.44				
1-Nonene					0.02
Cetene	2.73	0.37	1.24	1.14	0.32
1-Nonadecene	0.69	1.63	2.51	1.43	1.83
1-Octadecene			0.62		
5-Undecene, (E)-		0.06			
4-Dodecene, (E)-	0.15				
Z-1,8-Dodecadiene	0.08				
7-Tetradecene	0.45				
9-Eicosene, (E)-	0.42				
(-)-Aristolene	0.10	0.15			
.alpha.-Muurolene		0.10		0.18	
Cyclohexene, 4-pentyl-1-(4-propylcyclohexyl)-		0.79			
3-Undecene, (Z)-			0.08		
1-Octene, 3,7-dimethyl-			0.05		
1,7,7-Trimethyl-2-vinylbicyclo[2.2.1]hept-2-ene			0.23		
1-Pentadecene			0.31	0.77	
2-Methyl-Z-4-tetradecene			0.24	0.38	0.29

Z-8-Hexadecene			0.36	0.62	0.53
trans-8-tert-Butyl-bicyclo(4,3,0)non-3,7-diene				0.12	0.13
1-Tetradecene				0.39	0.38
Megastigma-4,6(E),8(E)-triene				0.24	
3-Heptadecene, (Z)-				0.61	
Z-5-Nonadecene				0.94	
10-Heneicosene (c,t)					0.44
1-Docosene					0.23
Alkynes					
7-Pentadecyne	0.24				
9-Nonadecyne		0.49			
9-Eicosyne			0.44		
Oct-3-ene-1,5-diyne, 3-t-butyl-7,7-dimethyl-					0.16
Amides/Amines					
Dodecanamide	5.30				
9-Octadecenamide, (Z)-	3.07	2.39	0.59		
Octadecanamide	0.91				
Cyclohexanamine, N-cyclooctylidene-	0.28				
4-Imidazolidinone, 2,2-dimethyl-3-[(1-methylethylidene)amino]-	0.24				
2-Methylbenzylamine, N,N-diheptyl-		0.29			
2-Myristynoyl-glycinamide		0.99	0.47	0.10	
Cyclobarbital		1.44			
1-Butanamine, N-(1-propylbutylidene)-			0.88		
Cyclopropane carboxamide, 2-cyclopropyl-2-methyl-N-(1-cyclopropylethyl)-	0.46				
4a,5,6,7,8,8a,10,10a-Octahydro-2H-1-oxa-9a-azaanthracen-9-one		0.58			
02-(p-Tolyl)ethylamine				0.22	
4-Dehydroxy-N-(4,5-methylenedioxy-2-nitrobenzylidene)tyramine		0.62	0.33		
Benzenamine, 4,4'-methylenebis[2-methyl-				0.27	
4-Benzylpiperidine		0.16			
Aromatic hydrocarbons					
Toluene		0.03		0.04	
Benzene, (1-methyl-1-butenyl)-			0.38		
Benzene, 1-methyl-4-butyl	0.12				
Naphthalene, 1,2,3,4-tetrahydro-2,2,5,7-tetramethyl-	0.20		0.07		
4,6,8-Trimethylazulene			0.07		
Benzene, propyl-		0.05	0.05		
Benzene, 1-ethyl-3-methyl-			0.06		
Benzene, pentyl-	0.58				
Benzene, hexyl-	0.27				

Benzene, butyl-	0.13				
Benzene, heptyl-	0.17				
1-Methyl-2-n-hexylbenzene	0.11				
Benzene, (1-methyldecyl)-	0.43	0.30			
Naphthalene	0.15	0.38	0.67	0.67	0.65
Benzene, octyl-	0.14	0.12	0.18	0.19	
Benz[f]azulene, 1,2,3,3a,4,9,10,10a-octahydro-	0.35				
Benzene, 1-isocyano-2-methyl-	0.09				
Benzene, 1-methyl-2-(1-ethylpropyl)-	0.17				
1H-Indene, 4,7-dimethyl-	0.19				
1,3-Dioxane, 4-phenyl-	0.12				
1-Cyclopentenylphenylmethane	0.07				
Mesitylene		0.11			
Benzene, 1-propenyl-		0.05			
Benzene, 1,2-diethyl-		0.08			
Benzene, 1-methyl-3-propyl-		0.10	0.28		0.30
Benzene, 1,2,3,5-tetramethyl-		0.23			
Benzene, 2-ethyl-1,4-dimethyl-		0.11	0.25	0.15	
Benzene, 4-ethyl-1,2-dimethyl-		0.10	0.34		
o-Cymene		0.28	0.43	0.55	0.46
Benzene, (1,1-dimethylpropyl)-		0.25	0.12	0.13	0.12
Benzene, 1-ethyl-2,3-dimethyl-		0.19		0.64	0.15
Benzene, 1,2,4,5-tetramethyl-		0.27	0.40	0.29	
Benzene, 1-methyl-4-(1-methylpropyl)-		0.18	0.61	0.18	0.64
Benzene, 1,3-diethyl-5-methyl-		0.09	0.15	0.29	0.27
1H-Indene, 2,3-dihydro-5-methyl-		0.18			0.34
Benzene, 2-ethenyl-1,4-dimethyl-		0.98		0.71	
Naphthalene, 1,2,3,4-tetrahydro-		0.05		0.08	0.06
1H-Indene, 2,3-dihydro-4,7-dimethyl-		0.15	0.68	0.26	0.65
Naphthalene, 1,6,7-trimethyl-			0.55	1.99	1.03
Benzene, 1,3,5-triethyl-		0.07	0.16	0.37	0.12
Benzene, (1,2-dimethyl-1-propenyl)-		0.20			0.32
Benzene, (1,3-dimethylbutyl)-		0.16			
Benzene, 2-ethenyl-1,3,5-trimethyl-		0.15	0.27		
Naphthalene, 1,2,3,4-tetrahydro-6-methyl-		0.18			
Naphthalene, 1-methyl-		0.84			0.97
Benzene, 1-(2-butenyl)-2,3-dimethyl-		0.07			
1-Methyl-4-n-hexylbenzene		0.16			
1H-Indene, 2,3-dihydro-1,1,3-trimethyl-		0.12			0.13
Naphthalene, 2-ethyl-		0.19			
Naphthalene, 2,7-dimethyl-		0.95	0.59	0.80	2.48
Benzene, 2-(2-butenyl)-1,3,5-trimethyl-		0.16			
Naphthalene, 2,3-dimethyl-		0.30			
1,1'-Biphenyl, 4-methyl-		0.27	0.12	0.53	0.50
Naphthalene, 1,4,6-trimethyl-		0.88	0.80		1.56

Naphthalene, 2,3,6-trimethyl-	0.19	0.18	0.46	0.34
Naphthalene, 1,6,7-trimethyl-	0.12	1.11		
Naphthalene, 1-(2-propenyl)-	0.10	0.17	0.25	
Benzene, (1-methyldecyl)-				
Diphenylacetylene	0.13			
Phenanthrene, 4-methyl-	0.23	0.26		0.85
Phenanthrene, 1-methyl-	0.13		0.93	0.38
2,4'-Dihydroxy-stilbene	0.08			
Phenanthrene, 3,6-dimethyl-	0.25	0.38		
Tetradecahydro-1-methylphenanthrene	0.44			
1,4-Benzenediol, 2,5-bis(1,1-dimethylethyl)-	0.54			
Benzene, 1-ethyl-2-methyl-	0.12	0.12	0.15	0.17
Benzene, 1-methyl-3-(1-methylethyl)-		0.05	0.19	0.18
Benzene, 1,2,3-trimethyl-		0.15	0.19	0.28
Benzene, 1-ethenyl-2-methyl-		0.07		
Benzene, 1,4-diethyl-			0.35	0.32
Benzene, 2-ethyl-1,3-dimethyl-		0.17		
Benzene, 1-ethenyl-4-ethyl-		0.35	0.37	
Benzene, (2-methyl-1-propenyl)-		0.98		
Naphthalene, 1,2,3,4-tetrahydro-				
Benzene, 1-ethyl-4-(1-methylethyl)-		0.12	0.11	0.11
Benzene, 1,4-diethyl-2-methyl-		0.87		
Naphthalene, 1,2,3,4-tetrahydro-5-methyl-		0.44	0.42	0.41
Benzene, 1-cyclopropylmethyl-4-(1-methylethyl)-		0.13		
Naphthalene, 2-methyl-			1.68	0.99
Naphthalene, 1,2,3,4-tetrahydro-1,4-dimethyl-		0.18	0.35	0.34
Naphthalene, 1-ethyl-		0.33	0.43	0.42
Naphthalene, 1,3-dimethyl-		0.67	0.84	
Naphthalene, 1,6-dimethyl-		0.50	0.64	
Naphthalene, 1,2,3,4-tetrahydro-1,5,7-trimethyl-		0.27		0.31
Naphthalene, 1,4-dimethyl-		0.34	0.42	
1,1'-Biphenyl, 2-methyl-		0.38		
Benzene, 1-ethyl-3,5-diisopropyl-		0.27		
Phenanthrene		0.20		
Anthracene, 9-methyl-		0.32		
di-p-Tolylacetylene		0.16	0.91	0.78
9,10-Dimethylanthracene		0.47		
Pyrene, 1-methyl-		0.44	0.56	0.25
4b,10b-Dihydro-4b,10b-methanochrysene		1.41		
1-(3-Methyl-2-butenoxy)-4-(1-propenyl)benzene	0.11			
Benzo[b]thiophene, 3,6-dimethyl-	0.09	0.15		0.17
Benzo[b]thiophene, 3,5-dimethyl-	0.08		0.41	0.24
Dibenzothiophene, 3-methyl-	0.17		0.29	0.31
2,7-Dimethyldibenzothiophene	0.23			
Benzo[b]thiophene		0.23	0.30	0.25

p-Propargyloxytoluene	0.14		
Benzenethiol, 4-(1,1-dimethylethyl)-2-methyl-	0.61		
Benzene, [(2-methylenecyclopropyl)thio]-	0.21		
4-Methylnaphtho[1,2-b]thiophene	0.52		
1-Methyldibenzothiophene	0.18	0.38	
2,8-Dimethyldibenzo(b,d)thiophene	0.50		0.59
2,6-Dimethyldibenzothiophene	0.08	0.53	0.13
1,7-Dimethyldibenzothiophene			0.46
Naphtho[2,3-b]thiophene, 4,9-dimethyl-	0.31	0.47	
Benzene, 2-propenyl-		0.11	
Benzene, 1-methyl-4-propyl-		0.30	0.14
Benzene, 1,2,3,4-tetramethyl-		0.18	0.39
3,4-Dimethylcumene		0.12	
1H-Indene, 2,3-dihydro-1,6-dimethyl-		0.32	
Naphthalene, 1,2,3,4-tetrahydro-2-methyl-		0.13	0.17
4,5-Dimethyl-3H-isobenzofuran-1-one		0.61	
Benzene, 1,3,5-trimethyl-2-(1-methylethenyl)-		0.12	
Naphthalene, 1,2,3,4-tetrahydro-2,5,8-trimethyl-		0.34	
Benzo[b]thiophene, 2,5,7-trimethyl-		0.62	
Benzo[b]thiophene, 2-ethyl-5,7-dimethyl-		0.39	0.39
Naphthalene, 1,2,3,4-tetramethyl-		0.47	0.15
Benzene, (1-methyl-1-propylpentyl)-		0.35	
Phenanthrene, 2-methyl-		0.39	
3,7-Dimethyldibenzothiophene		0.12	
Benzophenone, 2-hydroxy-4,4'-dimethyl-		0.33	
Methanone, phenyl(5,6,7,8-tetrahydro-1-naphthalenyl)-		0.22	
Benzene, (1-methylpropyl)-			0.08
Indane			0.09
p-Cymene			0.18
Benzene, (1,2,2-trimethylpropyl)-			0.21
Benzene, 1-ethenyl-3-ethyl-			0.69
Benzene, 1-methoxy-2-(1-methylethenyl)-			0.29
Benzene, 1-ethyl-3-(1-methylethyl)-			0.11
Benzene, 1-ethyl-4-(2-methylpropyl)-			0.19
3-Methylbenzothiophene			0.44
Benzene, ethylpentamethyl-			0.17
Benzo[b]thiophene, 2-ethyl-7-methyl-			0.20
Benzene, 1,1'-[(methylthio)ethenylidene]bis-			0.32
Phenanthrene, 2,3,5-trimethyl-			0.26
1-Methylphenanthro[4,5-bcd]thiophene			0.22
Dibenzo[b,d]thiophene, 1,3,6,7-tetramethyl-			0.27
Pyrene, 2-methyl-			0.25
1,3,6,8-Tetramethylanthracene			0.27
5-(2-Propenylidene)-10,11-dihydro-5H-dibenzo[a,d]cycloheptene		0.37	

Benzo[b]naphtho[2,3-d]thiophene					0.41
3-Methylbenzo[b]naphtho[2,1-d]thiophene					0.29
Benzo[b]naphtho[2,3-d]thiophene, 6,8-dimethyl-					0.86
2(1H)-Naphthalenone, octahydro-4a-methyl-7-(1-methylethyl)-, (4a.alpha.,7.beta.,8a.beta.)-	1.39				
2(1H)-Naphthalenone, 4a,5,6,7,8,8a-hexahydro-6-[1-(hydroxymethyl)ethenyl]-4,8a-dimethyl-, [4ar-(4a.alpha.,6.alpha.,8a.beta.)]-	0.74				
Benzaldehyde, 4-butyl-		0.34			
2(1H)-Naphthalenone, octahydro-4a-methyl-, cis-					0.24
Benzaldehyde, 2,4,6-trimethyl-				0.62	
Benzeneacetaldehyde, .alpha.,2,5-trimethyl-				0.05	0.04
Cyclopropane, 1,1-dimethyl-2-phenylethynyl-2-propyl-		0.19			
1H-Indene, 2-butyl-5-hexyloctahydro-			1.28		
Carbonyls					
Z,Z-10,12-Hexadecadienal		0.55	0.55		
9-Tetradecenal, (Z)-			0.29		
E-14-Hexadecenal		0.34	0.78		
Spiro[3.5]nonan-1-one, 5-methyl-, trans-	0.54				
2H-Inden-2-one, octahydro-3a-methyl-, trans-	0.11				
4-(2-Methyl-cyclohex-1-enyl)-but-3-en-2-one	0.20				
2,4-Cyclohexadien-1-one, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-	0.52	3.17		0.43	0.48
2-Cyclopenten-1-one, 3-methyl-2-(1,3-pentadienyl)-, (E,Z)-	0.14				
Cyclopentadecanone		0.16			
9,9-Dimethoxybicyclo[3.3.1]nona-2,4-dione		0.26			
1-Formyl-2,2,6-trimethyl-3-(3-methyl-but-2-enyl)-6-cyclohexene	1.80		0.19		
4-Methylphenyl acetone			0.33	0.31	
Spiro[3.6]deca-5,7-dien-1-one,5,9,9-trimethyl			0.28		
Cycloheptanone, 4-acetyl-7,7-dimethyl-2-(2-oxopropyl)-				0.37	
9H-Thioxanthen-9-one, 2-methyl-				0.29	
Antra-9,10-quinone, 1-(3-hydrohy-3-phenyl-1-triazenyl)-				0.10	
Scoparone					0.32
2-Furancarboxaldehyde, 5-[(5-methyl-2-furanyl)methyl]-		0.17			
E-15-Heptadecenal		0.75		0.47	
(S,S,S,S)-1,1'-Bicyclopentyl-2,2'-dicarboxaldehyde			0.09		
Z-11-Pentadecenal			0.17		
10-Methylanthracene-9-carboxaldehyde			0.39	0.36	
2-(3-Methyl-but-1-ynyl)-cyclohexene-1-carboxaldehyde				0.45	
Carboxylic acids					
9,12-Octadecadienoic acid (Z,Z)-	25.57	17.30	9.14		
n-hexadecanoic acid	4.98	3.06	1.20		

cis-Vaccenic acid		0.78			
Valeric acid, 4-phenyl-	0.07				
3-Hydroxy-3-phenylvaleric acid	0.05				
3-Pyrrolidin-2-yl-propionic acid	1.14				
Biphenyl-4-carboxylic acid, 4'-(1,1-dimethylethyl)-	0.15				
Octadecanoic acid	3.97	2.94	1.58		
Oleic Acid				2.02	
3-Methyl-4-(methoxycarbonyl)hexa-2,4-dienoic acid					0.20
4'-Ethyl-4-biphenylcarboxylic acid					0.58
2,1,3-Benzoselenadiazole-5-carboxylic acid					0.19
1-Naphthalenecarboxylic acid, 2-benzoyl-					0.64
3-Benzo[g]quinoxalin-2-yl-propionic acid					0.81
Esters					
Hexadecanoic acid, methyl ester	0.13				
E-6-Octadecen-1-ol acetate					
cis-7-Dodecen-1-yl acetate	0.19				
Octadecanoic acid, 2-propenyl ester	0.25				
1-Benzazirene-1-carboxylic acid, 2,2,5a-trimethyl-1a-[3-oxo-1-butenyl] perhydro-, methyl ester	0.47				
(1H)Pyrrole-3-carboxylic acid, 5-[cyano(4-morpholinyl)methyl]-1-(methoxymethyl)-, methyl ester	0.28		1.26		
Formic acid, 1-(4,7-dihydro-2-methyl-7-oxopyrazolo[1,5-a]pyrimidin-5-yl)-, methyl ester	0.69				
2-Propenoic acid, 3-(dimethylamino)-3-methoxy-, methyl ester	2.21				
2-Furancarboxylic acid, 1-cyclopentylethyl ester	0.10				
2-(Acetoxymethyl)-3-(methoxycarbonyl)biphenylene	0.18		1.68	0.67	1.86
Oxalic acid, 2-ethylhexyl hexyl ester	6.77	0.08			
Pentanoic acid, 1,1-dimethylpropyl ester		0.13			
Oxalic acid, cyclobutyl hexadecyl ester		0.49			
7,10-Hexadecadienoic acid, methyl ester		0.94			
Hexanoic acid, 2,7-dimethyloct-7-en-5-yn-4-yl ester		0.31			
Pyrazolo[5,1-c][1,2,4]triazine-3,8-dicarboxylic acid, 4-amino-, diethyl ester	1.02	0.23			
i-Propyl 9-tetradecenoate		0.61	0.40		
14-Methylpentadec-9-enoic acid methyl ester		0.72			
Benzoic acid, 3-methyl-, 2-methylpentyl ester			0.13		
2,2-Dimethylpropanoic acid, 4-cyanophenyl ester			0.21		
Z,Z-10,12-Hexadecadien-1-ol acetat			0.30		
Isopropyl linoleate			1.51		
E-8-Methyl-9-tetradecen-1-ol acetate			1.85		
Methoxyacetic acid, heptadecyl ester			0.43		
1H-Indole-2-carboxylic acid, 6-(4-ethoxyphenyl)-3-methyl-4-oxo-4,5,6,7-tetrahydro-, isopropyl ester	0.98				
1,2,4-Benzenetricarboxylic acid, 1,2-dimethyl nonyl ester			0.68		

n-Propyl 9-hexadecenoate				0.10
N-aromatic compounds				
Indole		0.46		
1H-Indole, 6-methyl-	0.32			
2-Ethylacridine	0.22	1.00	0.61	0.48
4-Pyridinemethanol, hexahydro-.alpha.,.alpha.-dimethyl-				
1H-Pyrrole, 1-phenyl-	0.12			
1H-Indole, 1-methyl-2-phenyl-	0.35			
Pyridine, 2,5-dimethyl-	0.25			
5-Methyl-2-phenylindolizine	0.37			
1H-Indole, 4-methyl-	3.30	0.16		
Indolizine, 2-(4-methylphenyl)-		0.32		
Indolizine			0.29	
Pyridine, 4-(1-pyrrolidinyl)-		0.08		
2-Amino-4-cyanomethyl-6-piperidino-1,3,5-triazine			0.36	
Dibenzo[c,h][2,6]naphthyridine				0.39
5-Ethoxy-6-methoxy-8-nitroquinoline				0.58
1,3-Diamino-5,6-dihydro-7-methoxybenzo[f]quinazoline				0.96
2-Methyl-3-nitroindolizine				0.25
2-Methyl-6-nitroaniline	0.30			
Benzo[h]quinoline, 2,4-dimethyl-	7.52	0.70	1.61	0.68
Nitriles/cyano compounds				
Pentadecanenitrile		0.55		
Hexadecanenitrile	0.71			
Benzonitrile, 2-methyl-				
Heptadecanenitrile		0.53		
Octadecanenitrile	0.72			0.61
Benzenepropanenitrile	0.16			
Heptanonitrile				
Octanenitrile	0.13			
2-Butenenitrile, 4-phenyl-2-(phenylamino)-			0.38	
(+-)-2-Phenylbutyronitrile				0.24
Phenols				
Phenol	0.15	0.10	0.11	
p-Cresol	0.35	0.28	0.30	
Phenol, 3-phenoxy-	0.23			
Phenol, 2,6-dimethyl-	0.12			
Phenol, 3-ethyl-5-methyl-	0.11			
Furan derivatives				
2,5-Furandione, 3-dodecyl-	1.53	0.30		
2-Vinylfuran				0.06

2,2'-Ethylidenebis(5-methylfuran)					0.37
Alcohols					
9,12-Octadecadien-1-ol, (Z,Z)-		0.36			
1-Hexadecanol	0.17				0.04
Cyclopentanepropanol, 2-methylene-	0.11				
1,5-Naphthalenediol, decahydro-	0.37				
5,10-Pentadecadien-1-ol, (Z,Z)-	0.84				
Ginsenol	0.29				
2-Methylindan-2-ol		0.21			
2-Propyn-1-ol, 3-(4-methylphenyl)-		0.09			
1H-Inden-5-ol, 2,3-dihydro-		0.09			
4-Methyl-dodec-3-en-1-ol		0.08			
5,9-Dimethyl-2-(1-methylethylidene)-1-cyclodecanol		0.36			
8-Oxabicyclo[3.2.1]octan-1-ol, 5-phenyl-			0.19		
1-Decanol, 2-octyl-			0.19		
Z,Z-8,10-Hexadecadien-1-ol			0.46		
Podocarp-13-en-12-ol			0.60		
1-Naphthalenemethanol, 1,2,3,4-tetrahydro-8-methyl-		0.04			
1-Naphthaleneethanol			0.12		
2-Indanol				0.30	
11-Methyldodecanol				0.24	
3-Octen-2-ol, 2-methyl-, (Z)-				0.49	
p-Menth-8(10)-en-9-ol, cis-				0.40	
5.beta.,7.beta.H,10.alpha.-Eudesm-11-en-1.alpha.-ol				0.28	
n-Tridecan-1-ol					0.24
1-Penten-3-ol, 1-phenyl-					0.82
2-Benzylidenecyclohexanol					0.25
Tridecanol, 2-ethyl-2-methyl-					0.44
1-Dodecanol, 2-octyl-					0.53
Cyclopentanemethanol, 1-hydroxy-.alpha.,3,3-trimethyl-2-(3-methyl-1,3-butadienyl)-		0.45			
1-Octadecanethiol					0.46
Others					
N,N'-di-n-Butylurea	0.20				
Ditetradecyl ether		0.42			
Oxirane, tridecyl-		0.20			
5,10-Diethoxy-2,3,7,8-tetrahydro-1H,6H-dipyrrolo[1,2-a:1',2'-d]pyrazine	0.87				
9-Octadecene, 1,1-dimethoxy-, (Z)-		0.25			
2H-1,3,4-Oxadiazin-2-one, 3,6-dihydro-5,6-dimethyl-6-(2-phenylethyl)	0.28				
5(10H)-Pyrido[3,4-b]quinolone, 7-methoxy-			0.26		0.66
2-p-Nitrophenyl-5-isopropyloxy-oxadiazole-1,3,4			0.61		
Indeno[1,2-b]quinoxalin-11-one, 2-methyl-5-oxy-			1.67	2.44	0.40

(-)-cis-3,4-Dimethyl-2-phenyltetrahydro-1,4-thiazine	1.77		
4-n-Hexylthiane, S,S-dioxide		0.19	
4'-Methoxy-2-hydroxystilbene		0.39	
Isobutyl nonyl carbonate			0.24

Table S3. Major amino acids present in *Salicornia bigelovii* on fresh weight basis. Reproduced with permission from Lyra et al., Plants; published by MDPI, 2022.

Amino Acids	***Shoots (mg/100g FW)***	***Seeds (mg/100g FW)***
Lysine (Lys)	43.8	573.8
Histidine (His)	29.2	353.7
Arginine (Arg)	46.3	903.3
Threonine (Thr)	37.0	245.3
Valine (Val)	45.0	289.5
Methionine (Met)	12.8	152.8
Cystine (Cys)	11.0	1404.3
Isoleucine (Ile)	39.3	240.8
Leucine (Leu)	67.3	607.2
Phenylalanine (Phe)	45.0	128.8
Tyrosine (Tyr)	5.5	721.8
Glycine (Gly)	44.2	1993.2
Serine (Ser)	34.8	893.2
Aspartic acid (Asp)	78.7	1303.8
Glumatic acid (Glu)	107.7	2696.7
Proline (Pro)	36.7	343.3
Alanine (Ala)	45.0	843.7

Table S4. Fatty acid composition of *Salicornia bigelovii.* Reproduced with permission from Attia et al., Animal Feed Science and Technology; published by Elsevier, 1997.

Fatty acids	*g/kg*
Myristic (C14:0)	1.78
Palmatic acid (C16:0)	85.04
Oleic acid (C18:1 n-9)	199.85
Linoleic acid (C18:2 n-6)	634.00
Linolenic acid (C18:3 n-3)	13.40
Arachidonic acid (C20:0)	65.90
MUFA (Mono-unsaturated)[a]	199.85
PUFA (Poly-unsaturated)[b]	647.40
SAFA (Saturated)[c]	152.40

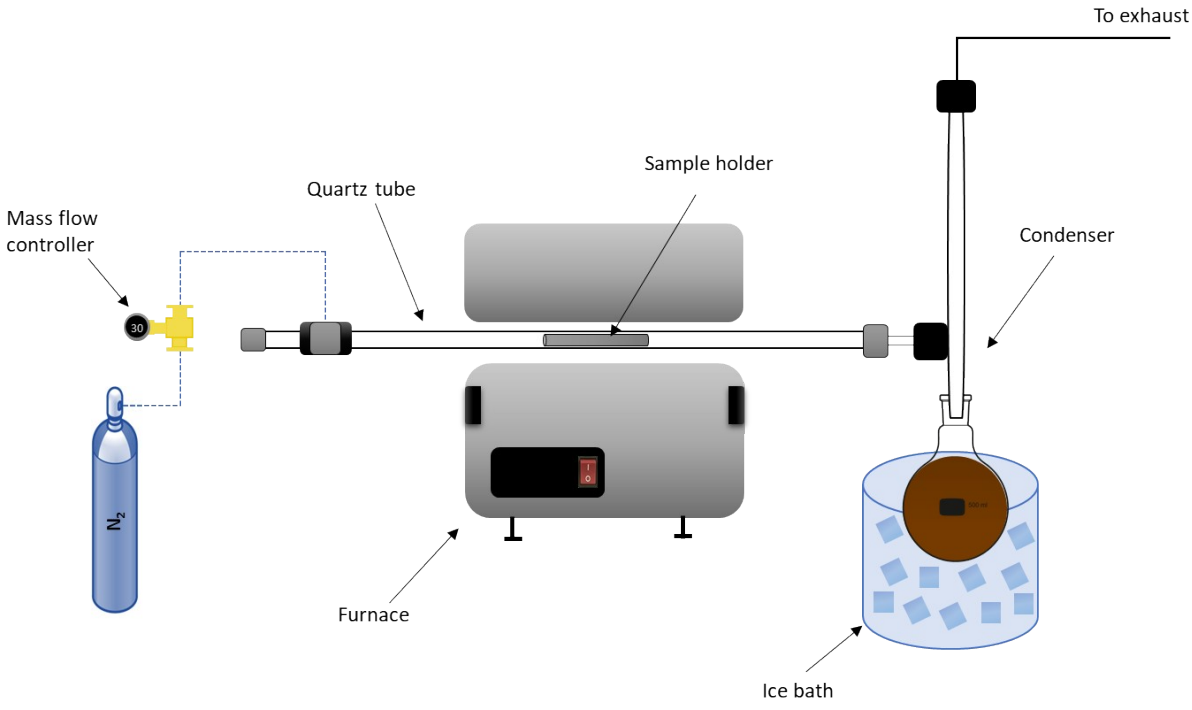
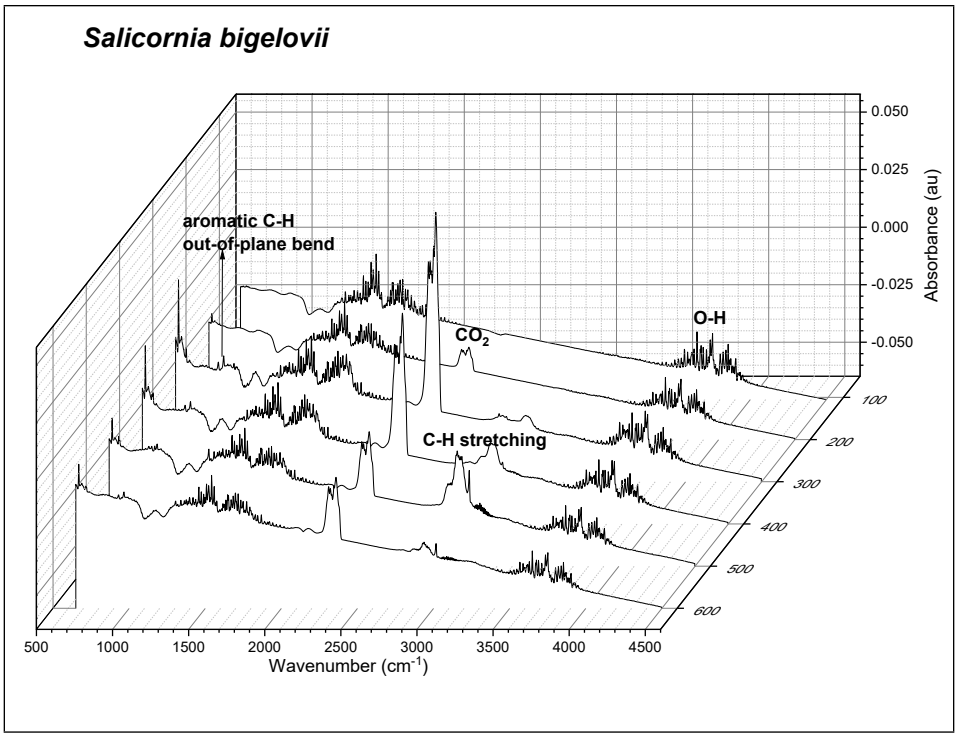
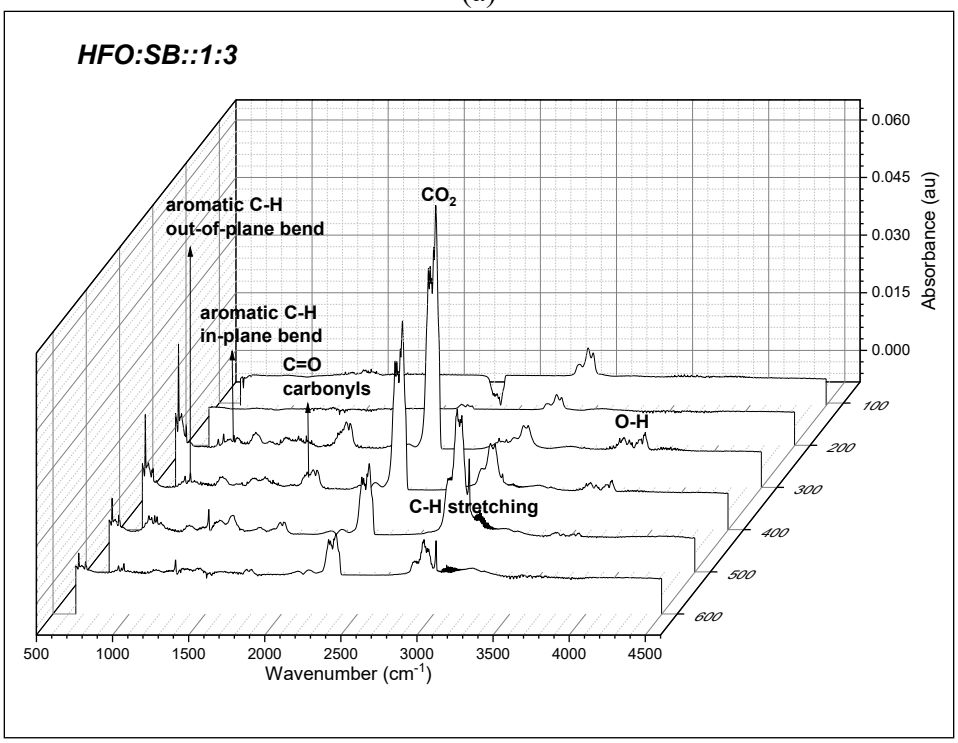


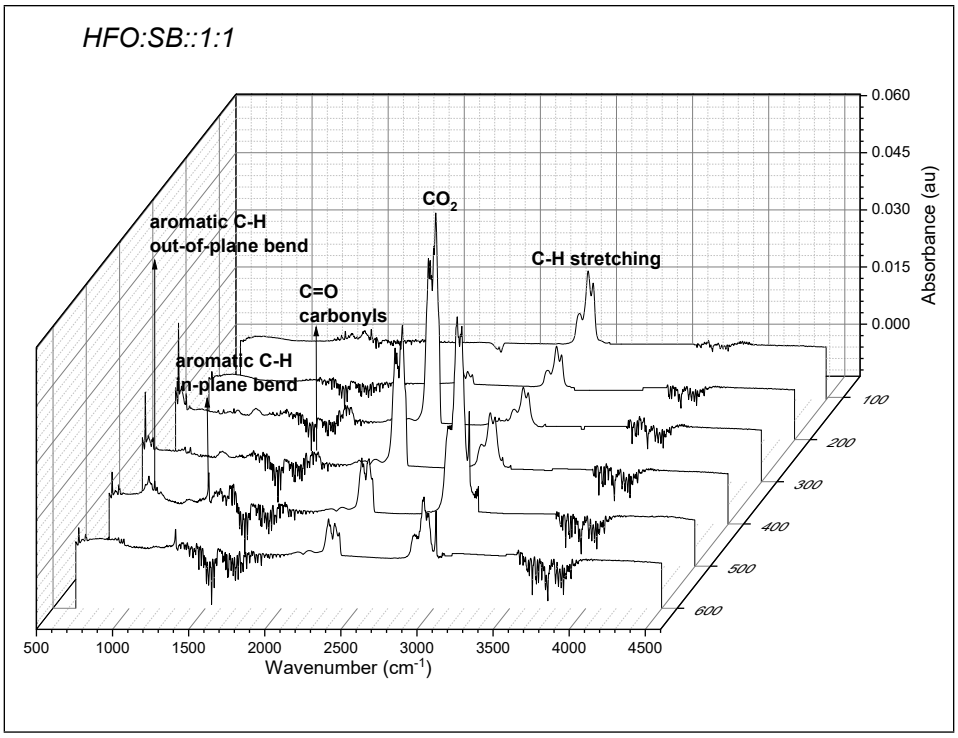
Figure S1. Schematic of pyrolysis reactor setup.


Salicornia bigelovii
aromatic C-H
out-of-plane bend
CO2
O-H
C-H stretching
0.050
0.025
0.000
-0.025
-0.050
Absorbance (au)
100
200
300
400
500
600
500
1000
1500
2000
2500
3000
3500
4000
4500
Wavenumber (cm-1)

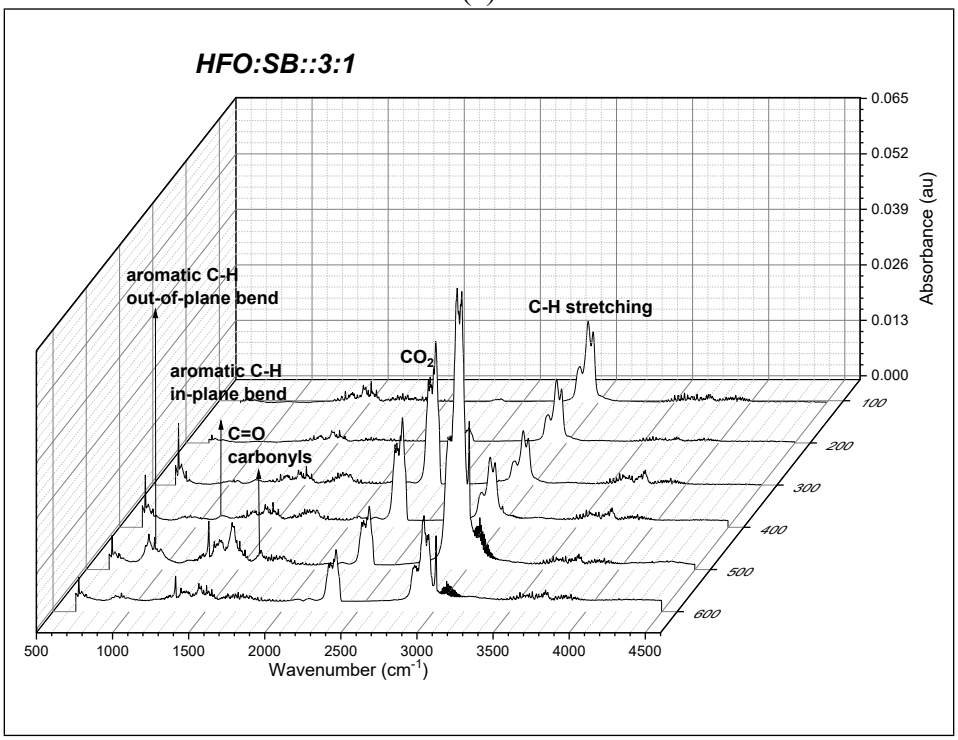
(a)


HFO:SB::1:3
aromatic C-H
out-of-plane bend
CO2
aromatic C-H
in-plane bend
C=O
carbonyls
O-H
C-H stretching
0.060
0.045
0.030
0.015
0.000
Absorbance (au)
100
200
300
400
500
600
500
1000
1500
2000
2500
3000
3500
4000
4500
Wavenumber (cm-1)

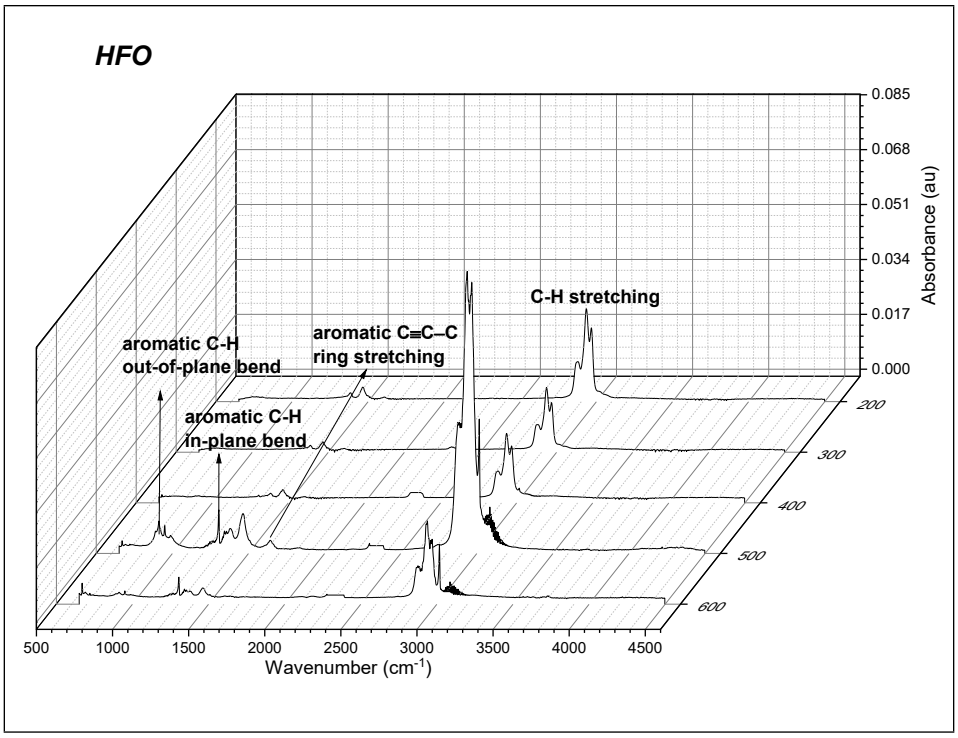
(b)


HFO:SB::1:1
aromatic C-H
out-of-plane bend
CO2
C-H stretching
C=O
carbonyls
aromatic C-H
in-plane bend
0.060
0.045
0.030
0.015
0.000
Absorbance (au)
100
200
300
400
500
600
500
1000
1500
2000
2500
3000
3500
4000
4500
Wavenumber (cm-1)

(c)


HFO:SB::3:1
aromatic C-H
out-of-plane bend
C-H stretching
CO2
aromatic C-H
in-plane bend
C=O
carbonyls
0.065
0.052
0.039
0.026
0.013
0.000
Absorbance (au)
100
200
300
400
500
600
500
1000
1500
2000
2500
3000
3500
4000
4500
Wavenumber (cm-1)

(d)



(e)

Figure S2. FTIR spectra obtained from pyrolysis of (a) SB (b) 25% HFO (c) 50%HFO (d) 75% HFO and (e) 100% HFO.

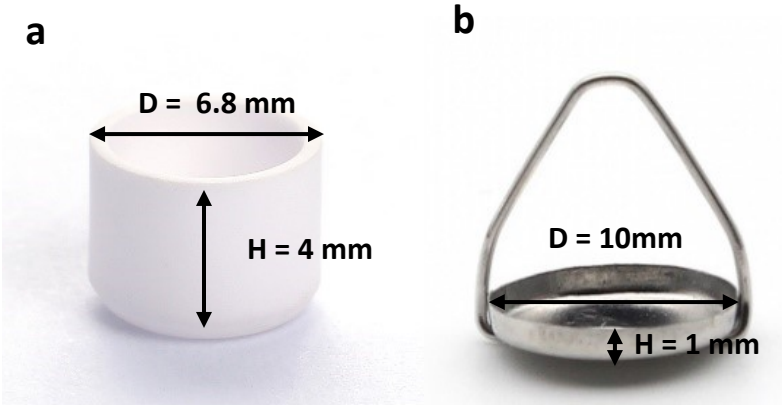


Figure S3. Crucibles used for TGA a) 85 µL Alumina crucible and b) 100 µL Platinum-HT sample pan.

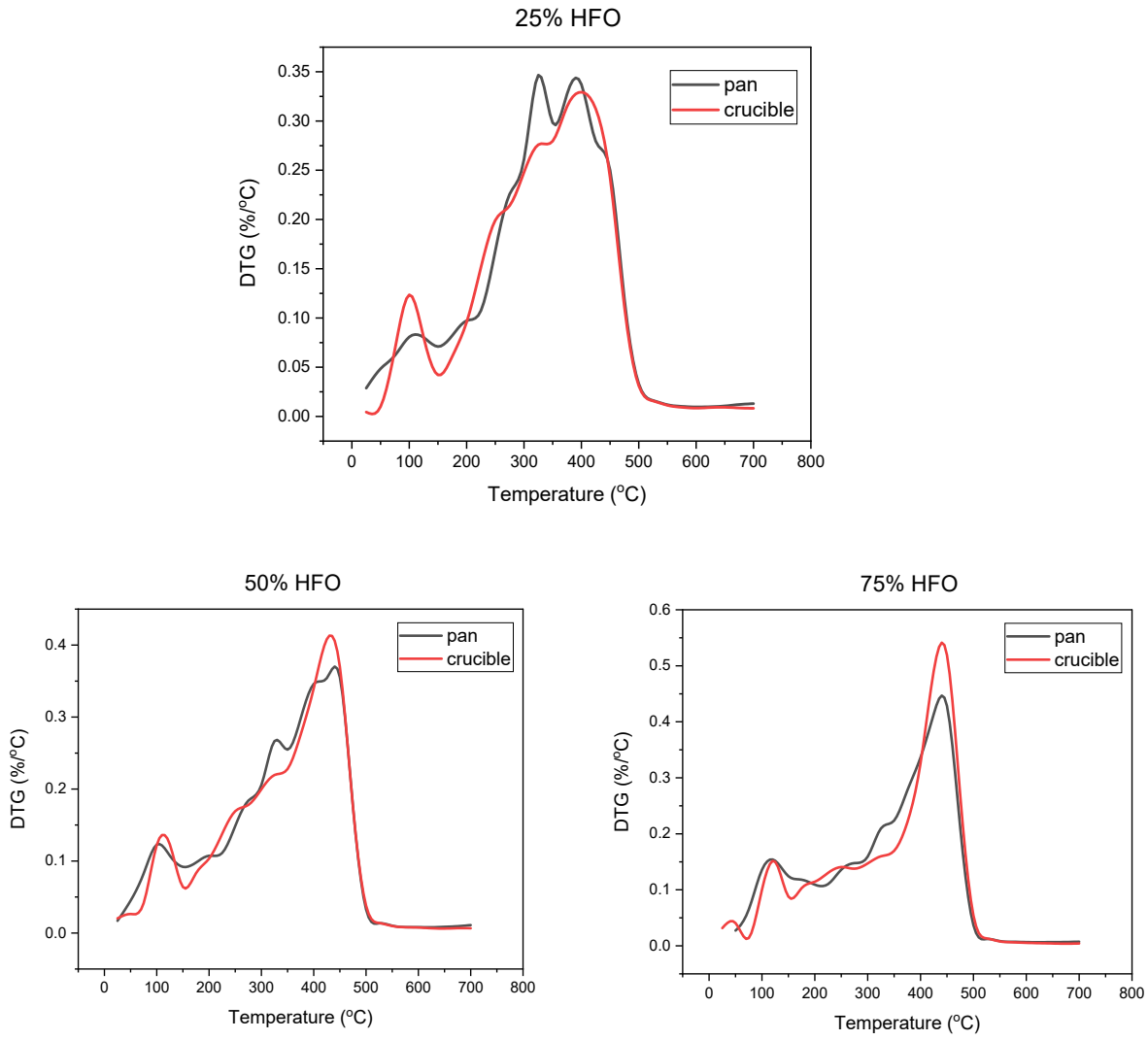


Figure S4. DTG curves of SB and HFO mixtures in alumina crucibles and platinum pans.