Supporting Information – Part 2

Hydrogen evolution from hydrocarbon pyrolysis in a simulated liquid metal bubble reactor

Fabiyan Angikath
fabiyan.angikathshamsudheen@kaust.edu.sa

Faseeh Abdulrahman
faseeh.kulangarakandiyil@kaust.edu.sa

Muralikrishna Khandavilli
muralikrishna.khandavilli@combustionmodeling.com

Xiaoyuan Zhang
xiaoyuan.zhang@kaust.edu.sa

*S. Mani Sarathy
mani.sarathy@kaust.edu.sa

King Abdullah University of Science and Technology,
Clean Combustion Research Center,
Physical Science and Engineering Division (PSE),
Thuwal 23955-6900, Saudi Arabia

*Corresponding Author
mani.sarathy@kaust.edu.sa
Tel. No.: +966544700142
Combustion and Pyrolysis Chemistry Laboratory
Clean Combustion Research Center
King Abdullah University of Science and Technology
Thuwal, 23955-6900
Saudi Arabia

FACEJ FUEL

Height of reactor, $h = 10\ m$

Diameter of reactor, $D = 2.5\ m$

Molar feed rate, $F = 100\ mol/s$

1) $T = 1000^{o}C$ and $P = 10\ atm$

	INLET (BOTTOM) Number of moles (N_i)				OUTLET (TOP) Number of moles (N_o)				Residence Time (s)	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	60.3787	25.9187	34.4691	-	54.1641	38.3480	40.6837	-	22.4160	10.2928
Aromatics	10.9303	12.4470	25.6918	21.3136	10.9306	13.2224	27.8583	20.9524	40.7128	1.6944
Total	-	-	-	-	65.0947	51.5704	68.5420	20.9524	-	-

Aromatic Mass Balance Error = 0.0285%

H_2 per kg fuel = 0.0288 kg H_2 / kg Fuel input

Total Mass In = 3.6085 kg/s

Total Mass Out = 3.6079 kg/s

2) $T = 1000^oC$ and $P = 20\ atm$

	INLET (BOTTOM) Number of moles (N_i)				OUTLET (TOP) Number of moles (N_o)				Residence Time (s)	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	62.5364	23.7498	32.5951	-	54.0611	40.7005	41.0704	-	69.8043	13.5527
Aromatics	11.1755	12.9961	26.4059	21.2246	11.1835	15.3110	36.4869	19.5431	98.2510	7.9224
Total	-	-	-	-	65.2446	56.0115	77.5573	19.5431	-	-

Aromatic Mass Balance Error = 0.2508%

H_2 per kg fuel = 0.0312 kg H_2 / kg Fuel

Total Mass In = 3.6229 kg/s

Total Mass Out = 3.6175 kg/s

3) $T = 1000^oC$ and $P = 50\ atm$

	INLET (BOTTOM) Number of moles (N_i)				OUTLET (TOP) Number of moles (N_o)				Residence Time (s)	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	65.8483	21.5258	30.3944	-	54.5740	44.0744	41.6688	-	209.0409	17.1216
Aromatics	11.5003	13.7500	27.3615	21.0934	11.8210	22.0332	78.2201	12.5635	274.7311	40.4388
Total	-	-	-	-	66.3950	66.1076	119.8889	12.5635	-	-

Aromatic Mass Balance Error = 1.5344%

H_2 per kg fuel = 0.0365 kg H_2 / kg Fuel

Total Mass In = 3.6531 kg/s

Total Mass Out = 3.6195 kg/s]

4) $T = 1200^{o}C$ and $P = 10\ atm$

	INLET (BOTTOM) Number of moles (N_i)				OUTLET (TOP) Number of moles (N_o)				Residence Time (s)	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	53.9187	50.5631	48.7433	-	9.8199	138.7607	92.8421	-	12.7914	81.7876
Aromatics	10.6260	19.5874	32.8739	19.4308	14.9915	93.1186	145.0931	0	37.8317	100
Total	-	-	-	-	24.8114	231.8793	237.9352	0	-	-

Aromatic Mass Balance Error = 2.2778%

H_2 per kg fuel = 0.1272 kg H_2 / kg Fuel

Total Mass In = 3.6747 kg/s

Total Mass Out = 3.7232 kg/s

5) $T = 1200^{o}C$ and $P = 20\ atm$

	INLET (BOTTOM) Number of moles (N_i)				OUTLET (TOP) Number of moles (N_o)				Residence Time (s)	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	55.4554	42.8004	44.3461	-	7.8956	137.9199	91.9059	-	39.6327	85.7622
Aromatics	10.9342	20.5830	34.0046	19.4324	16.0701	89.9221	145.4633	0	92.8229	100
Total	-	-	-	-	23.9657	227.8420	237.3692	0	-	-

Aromatic Mass Balance Error = 2.0059%

H_2 per kg fuel = 0.1258 kg H_2 / kg Fuel

Total Mass In = 3.6516 kg/s

Total Mass Out = 3.6947 kg/s

6) $T = 1200^{o}C$ and $P = 50\ atm$

	INLET (BOTTOM) Number of moles (N_i)				OUTLET (TOP) Number of moles (N_o)				Residence Time (s)	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	57.6574	35.3320	39.8336	-	13.0117	124.6235	84.4793	-	129.7187	77.4328
Aromatics	11.3189	21.9066	35.4450	21.0934	18.0257	92.3017	155.2984	0	237.5062	100
Total	-	-	-	-	31.0374	216.9252	239.7777	0	-	-

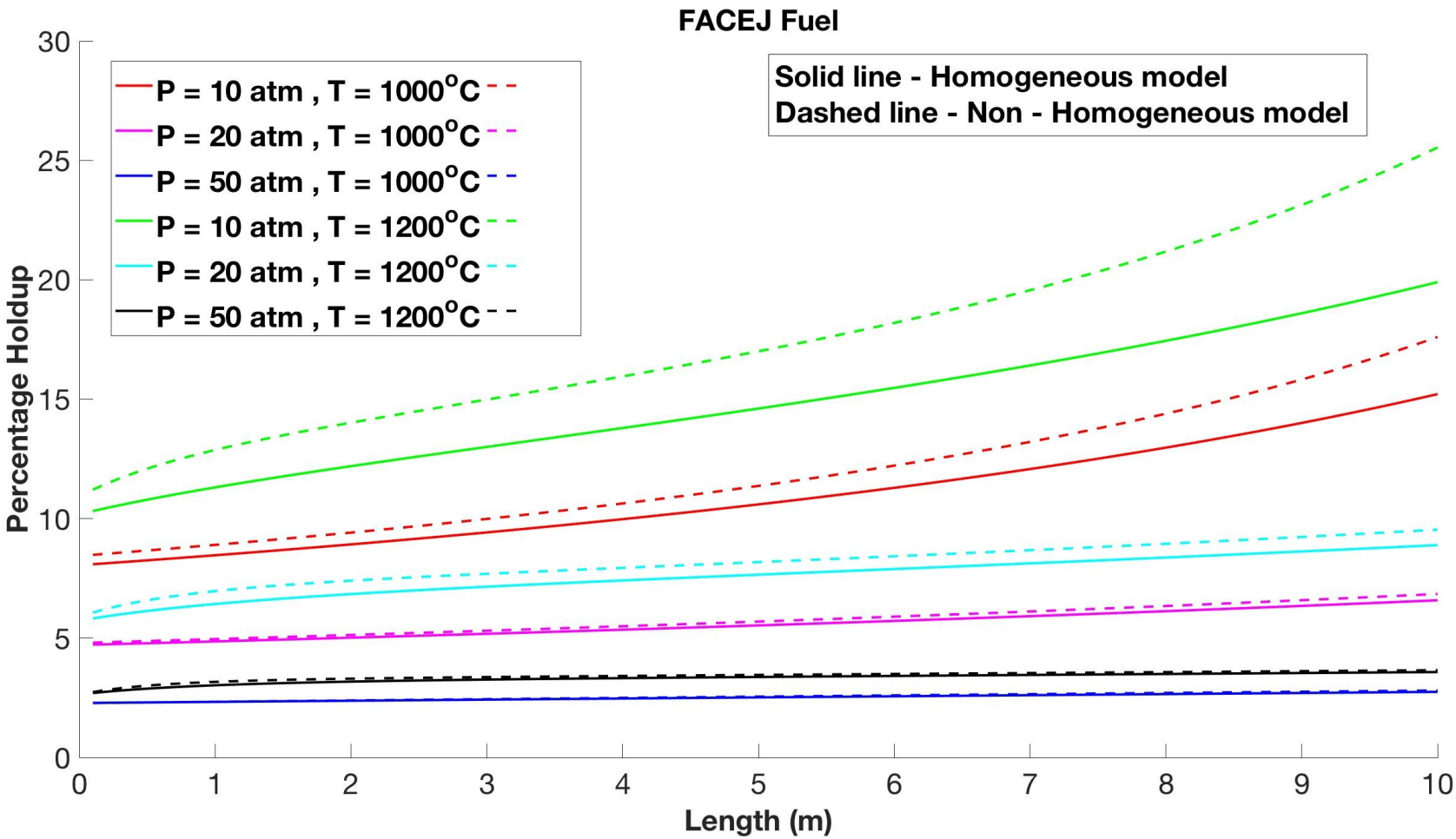
Aromatic Mass Balance Error = 1.8010%

H_2 per kg fuel = 0.1159 kg H_2 / kg Fuel

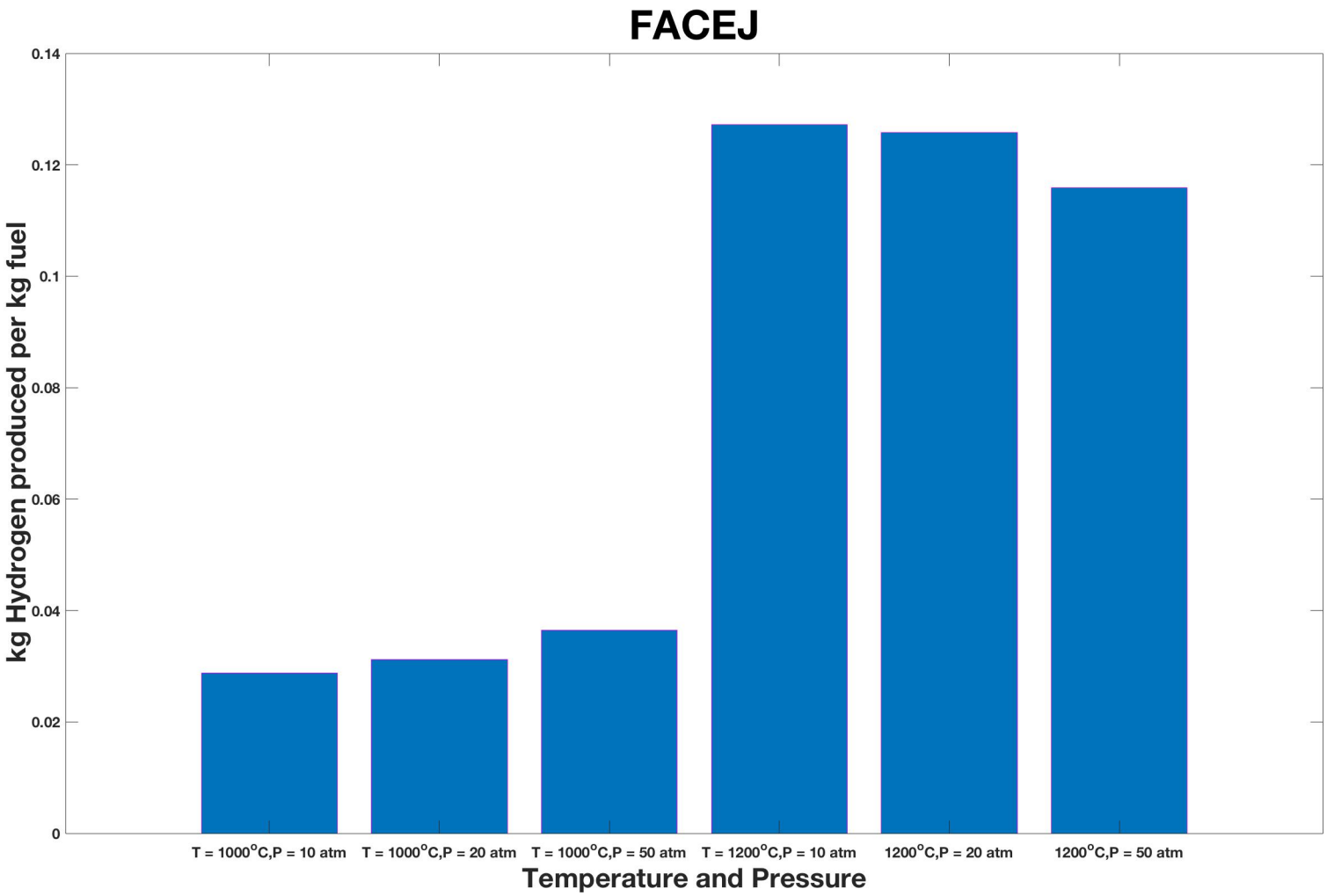
Total Mass In = 3.7735 kg/s

Total Mass Out = 3.8150 kg/s

GAS HOLDUP PLOTS



Hydrogen produced per kg Fuel



FACEA FUEL

Height of reactor, $h = 10\ m$

Diameter of reactor, $D = 2.5\ m$

Molar feed rate, $F = 100\ mol/s$

1) $T = 1000^{o}C$ and $P = 10\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time (s)	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	91.6737	37.1104	65.0998	-	82.5085	55.4406	74.2649	-	15.9205	9.9975
Aromatics	0	0	0	7.4294	0.0017	0.8215	2.1636	7.0685	117.8174	4.8577
Total	-	-	-	-	82.5103	56.2621	76.4286	7.0685	-	-

Aromatic Mass Balance Error = 0.0894%

H_2 per kg fuel = 0.0390 kg H_2 / kg Fuel

Total Mass In = 2.9075 kg/s

Total Mass Out = 2.9070 kg/s

2) $T = 1000^{o}C$ and $P = 20\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	96.0104	33.5776	62.0010	-	83.0122	59.5741	74.9993	-	46.9117	13.5384
Aromatics	0	0	0	7.4851	0.0396	2.4245	9.3321	5.9232	278.5976	20.8673
Total	-	-	-	-	83.0518	61.9985	84.3314	5.9232	-	-

Aromatic Mass Balance Error = 0.7519%

H_2 per kg fuel = 0.0426 kg H_2 / kg Fuel

Total Mass In = 2.9370 kg/s

Total Mass Out = 2.9327 kg/s

3) $T = 1000^{o}C$ and $P = 50\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	102.0946	29.8647	58.2580	-	84.2101	65.6336	76.1425	-	137.8650	17.5176
Aromatics	0	0	0	7.5356	1.5690	8.6705	33.0434	1.7669	769.0138	76.5529
Total	-	-	-	-	85.7791	74.3042	109.1859	1.7669	-	-

Aromatic Mass Balance Error = 1.8817%

H_2 per kg fuel = 0.0502 kg H_2 / kg Fuel

Total Mass In = 2.9861 kg/s

Total Mass Out = 2.9751 kg/s]

4) $T = 1200^oC$ and $P = 10\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	70.3536	69.9675	86.4055	-	14.2885	182.0977	142.4705	-	10.1326	79.6904
Aromatics	0	0	0	6.6190	1.4871	25.0481	38.2271	0	111.0586	100
Total	-	-	-	-	15.7757	207.1458	180.6976	0	-	-

Aromatic Mass Balance Error = 3.1854%

H_2 per kg fuel = 0.1479 kg H_2 / kg Fuel

Total Mass In = 2.8243 kg/s

Total Mass Out = 2.8409 kg/s

5) $T = 1200^oC$ and $P = 20\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	75.0714	60.0619	81.6752	-	11.2654	187.6739	145.4812	-	29.3564	84.9938
Aromatics	0	0	0	6.8634	1.8140	24.4900	39.3663	0	262.8116	100
Total	-	-	-	-	13.0794	212.1639	184.8475	0	-	-

Aromatic Mass Balance Error = 2.8322%

H_2 per kg fuel = 0.1505 kg H_2 / kg Fuel

Total Mass In = 2.8423 kg/s

Total Mass Out = 2.8576 kg/s

6) $T = 1200^{o}C$ and $P = 50\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	81.0641	49.9348	76.1242	-	18.3611	175.3408	138.8272	-	92.3388	77.3499
Aromatics	0	0	0	7.1132	2.2617	23.7390	40.4176	0	704.2945	100
Total	-	-	-	-	20.6228	199.0798	179.2448	0	-	-

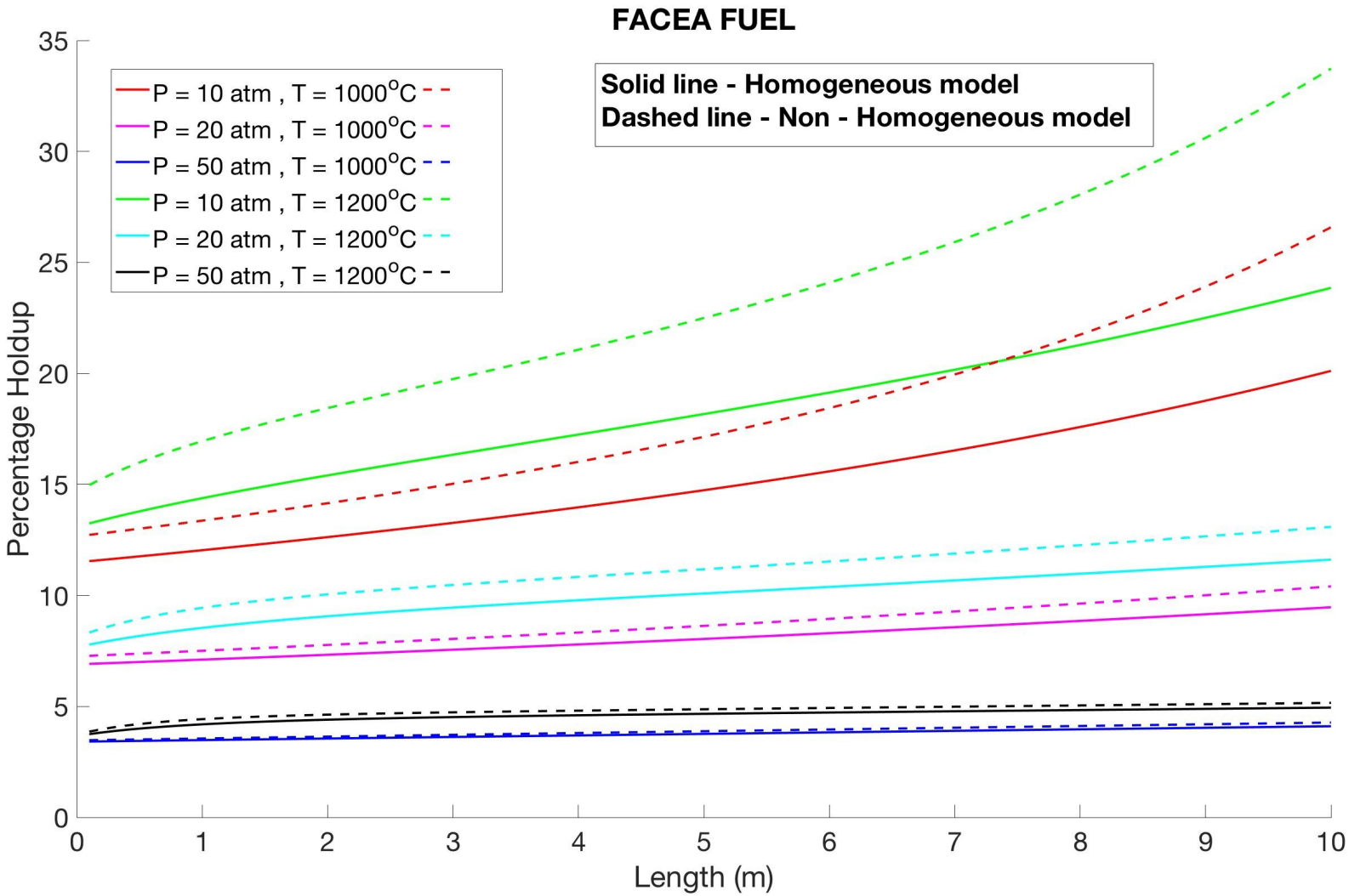
Aromatic Mass Balance Error = 2.5131%

H_2 per kg fuel = 0.1398 kg H_2 / kg Fuel

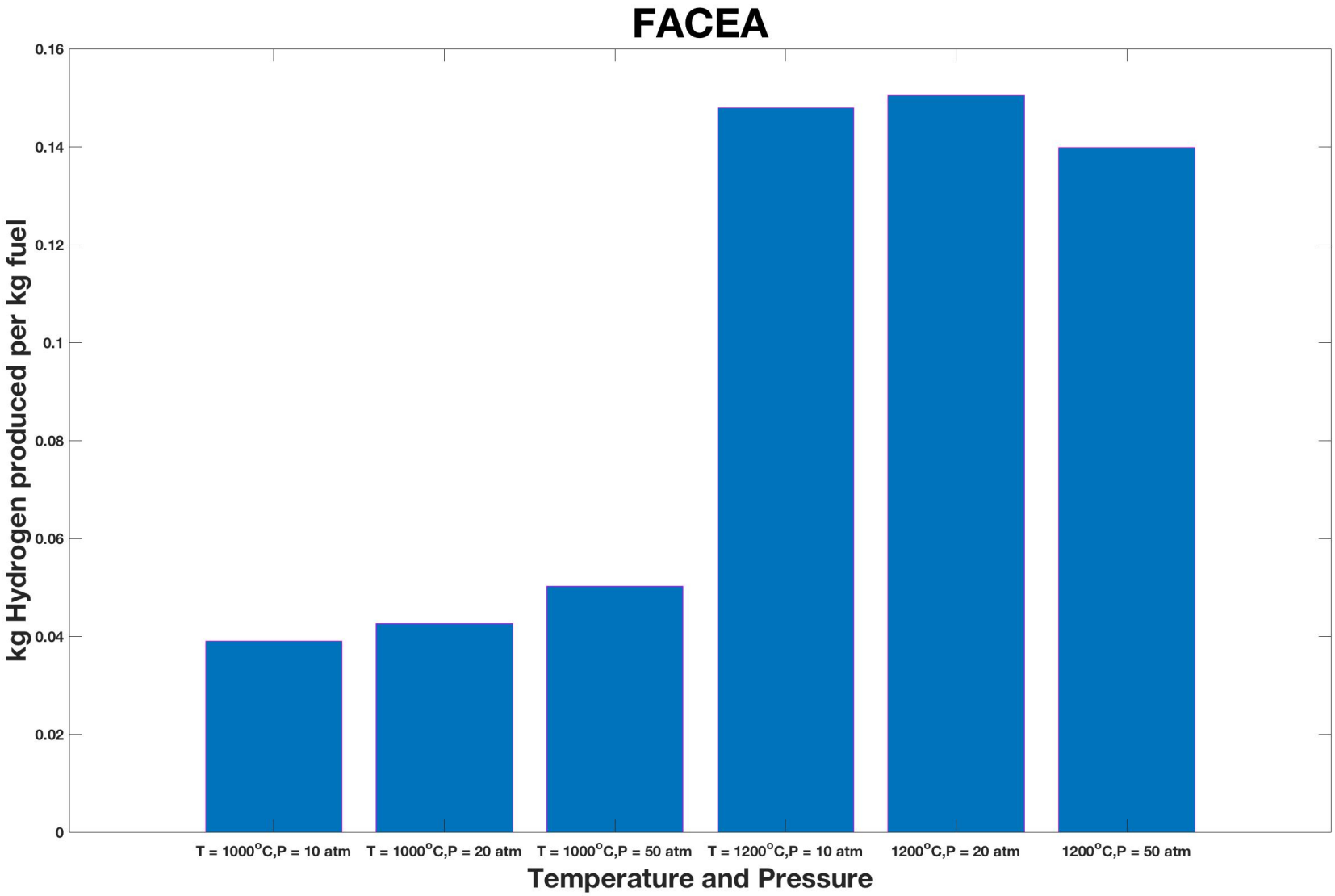
Total Mass In = 2.8708 kg/s

Total Mass Out = 2.8850 kg/s

GAS HOLDUP PLOTS



Hydrogen produced per kg Fuel



C10H20D FUEL

Height of reactor, $h = 10\ m$

Diameter of reactor, $D = 2.5\ m$

Molar feed rate, $F = 100\ mol/s$

1) $T = 1000^{o}C$ and $P = 10\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	81.0153	32.4575	71.3238	-	72.7460	48.9960	79.5931	-	17.6988	10.2070
Aromatics	2.5378	2.8899	5.9651	11.1962	2.5387	3.6936	8.1363	10.8342	77.9478	3.2334
Total	-	-	-	-	75.2847	52.6896	87.7293	10.8342	-	-

Aromatic Mass Balance Error = 0.0569%

H_2 per kg fuel = 0.0330 kg H_2 / kg Fuel

Total Mass In = 3.2143 kg/s

Total Mass Out = 3.2137 kg/s

2) $T = 1000^oC$ and $P = 20\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	86.3231	28.0535	67.6658	-	74.2595	52.1806	79.7294	-	52.7092	13.9749
Aromatics	2.6000	3.0236	6.1434	11.2084	2.6213	5.4050	15.8530	9.5866	186.0513	14.4696
Total	-	-	-	-	76.8808	57.5856	95.5824	9.5866	-	-

Aromatic Mass Balance Error = 0.4933%

H_2 per kg fuel = 0.0357 kg H_2 / kg Fuel

Total Mass In = 3.2510 kg/s

Total Mass Out = 3.2461 kg/s

3) $T = 1000^oC$ and $P = 50\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	93.9283	23.4726	63.1947	-	76.6673	57.9946	80.4557	-	153.3272	18.3768
Aromatics	2.6805	3.2049	6.3775	11.2074	3.5311	11.7239	47.4132	4.2264	517.0670	62.2895
Total	-	-	-	-	80.1985	69.7185	127.8689	4.2264	-	-

Aromatic Mass Balance Error = 2.1574%

H_2 per kg fuel = 0.0424 kg H_2 / kg Fuel

Total Mass In = 3.3144 kg/s

Total Mass Out = 3.2928 kg/s

4) $T = 1200^{o}C$ and $P = 10\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	62.3876	80.6935	93.5458	-	15.6544	174.1599	140.2790	-	10.4389	74.9078
Aromatics	2.4022	4.4280	7.4316	10.3267	4.7223	43.5071	67.0719	0	71.1843	100
Total	-	-	-	-	20.3767	217.6669	207.3509	0	-	-

Aromatic Mass Balance Error = 2.7237%

H_2 per kg fuel = 0.1358 kg H_2 / kg Fuel

Total Mass In = 3.2303 kg/s

Total Mass Out = 3.2561 kg/s

5) $T = 1200^{o}C$ and $P = 20\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	66.9928	66.9764	88.5700	-	11.6788	177.6044	143.8839	-	30.8020	82.5670
Aromatics	2.4934	4.6937	7.7543	10.4754	5.2620	42.0720	67.8379	0	172.1919	100
Total	-	-	-	-	16.9408	219.6764	211.7219	0	-	-

Aromatic Mass Balance Error = 2.4119%

H_2 per kg fuel = 0.1369 kg H_2 / kg Fuel

Total Mass In = 3.2342 kg/s

Total Mass Out = 3.2575 kg/s

6) $T = 1200^{o}C$ and $P = 50\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	71.9804	52.8995	82.5481	-	16.9579	162.9446	137.5706	-	99.3774	76.4410
Aromatics	2.6032	5.0383	8.1520	10.6099	5.9767	40.4470	68.4381	0	472.1807	100
Total	-	-	-	-	22.9346	203.3916	206.0087	0	-	-

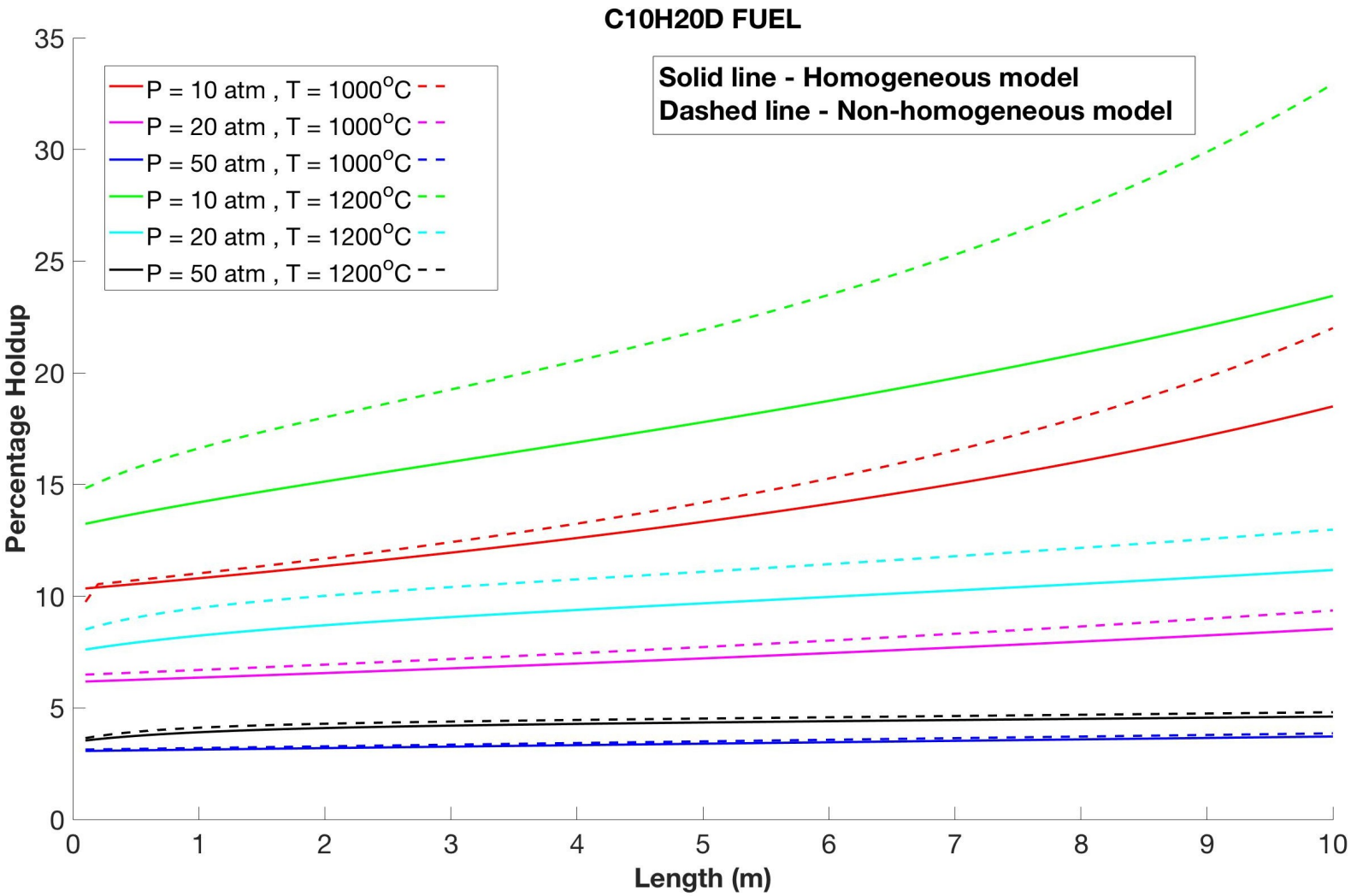
Aromatic Mass Balance Error = 2.1283%

H_2 per kg fuel = 0.1269 kg H_2 / kg Fuel

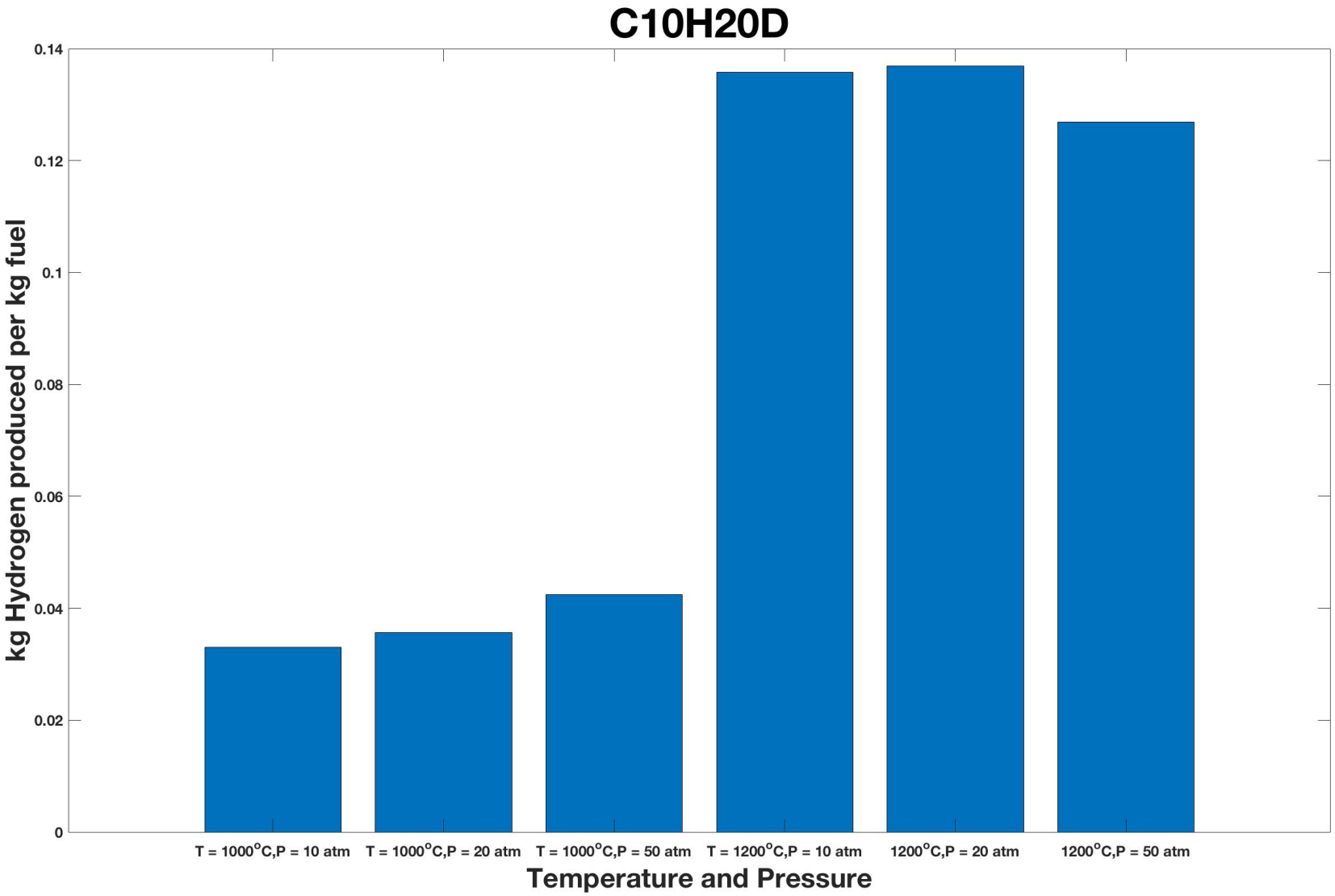
Total Mass In = 3.2312 kg/s

Total Mass Out = 3.2522 kg/s

GAS HOLDUP PLOTS



Hydrogen produced per kg Fuel



C10H18C FUEL

Height of reactor, $h = 10\ m$

Diameter of reactor, $D = 2.5\ m$

Molar feed rate, $F = 100\ mol/s$

1) $T = 1000^{o}C$ and $P = 10\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	85.4343	28.5750	51.3392	-	76.2176	47.0085	60.5559	-	17.5230	10.7881
Aromatics	4.6259	5.2677	10.8732	20.1237	4.6262	6.0511	13.0619	19.7588	43.3809	1.8130
Total	-	-	-	-	80.8438	53.0595	73.6178	19.7588	-	-

Aromatic Mass Balance Error = 0.0350%

H_2 per kg fuel = 0.0279 kg H_2 / kg Fuel

Total Mass In = 3.8319 kg/s

Total Mass Out = 3.8313 kg/s

2) $T = 1000^{o}C$ and $P = 20\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	88.7978	25.6705	48.5895	-	75.9767	51.3126	61.4106	-	52.3682	14.4385
Aromatics	4.7372	5.5090	11.1933	20.1361	4.7458	7.8292	21.2515	18.4583	103.5623	8.3323
Total	-	-	-	-	80.7225	59.1418	82.6621	18.4583	-	-

Aromatic Mass Balance Error = 0.3027%

H_2 per kg fuel = 0.0309 kg H_2 / kg Fuel

Total Mass In = 3.8540 kg/s

Total Mass Out = 3.8486 kg/s

3) $T = 1000^{o}C$ and $P = 50\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	93.6422	22.6419	45.3235	-	76.2829	57.3606	62.6828	-	154.4901	18.5379
Aromatics	4.8820	5.8370	11.6153	20.1257	5.2268	14.1375	61.8717	11.6922	287.9404	41.9043
Total	-	-	-	-	81.5097	71.4981	124.5545	11.6922	-	-

Aromatic Mass Balance Error = 1.8242%

H_2 per kg fuel = 0.0370 kg H_2 / kg Fuel

Total Mass In = 3.8936 kg/s

Total Mass Out = 3.8608 kg/s

4) $T = 1200^{o}C$ and $P = 10\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	69.2641	58.9197	73.2142	-	12.1889	173.0702	130.2894	-	10.6249	82.4023
Aromatics	4.4347	8.1747	13.7197	18.7901	8.6563	79.2814	122.2387	0	39.1217	100
Total	-	-	-	-	20.8452	252.3516	252.5282	0	-	-

Aromatic Mass Balance Error = 2.7180%

H_2 per kg fuel = 0.1328 kg H_2 / kg Fuel

Total Mass In = 3.8292 kg/s

Total Mass Out = 3.8761 kg/s

5) $T = 1200^{o}C$ and $P = 20\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	71.7387	50.0407	69.0747	-	9.8117	173.8948	131.0017	-	31.6949	86.3231
Aromatics	4.5846	8.6303	14.2579	18.9835	9.6019	76.3674	123.1415	0	95.0182	100
Total	-	-	-	-	19.4136	250.2622	254.1432	0	-	-

Aromatic Mass Balance Error = 2.4067%

H_2 per kg fuel = 0.1319 kg H_2 / kg Fuel

Total Mass In = 3.8262 kg/s

Total Mass Out = 3.8683 kg/s

6) $T = 1200^{o}C$ and $P = 50\ atm$

	INLET (BOTTOM)				OUTLET (TOP)				Residence Time	Methane / Benzene Conversion (%)
	CH_4	H_2	C	$C6H6$	CH_4	H_2	C	$C6H6$		
Non-Aromatics	75.2194	41.0820	64.2161	-	16.6470	158.2268	122.7884	-	102.2193	77.8687
Aromatics	4.7691	9.2301	14.9344	19.1560	10.8599	73.1597	123.7796	0	261.5266	100
Total	-	-	-	-	27.5069	231.3864	246.5680	0	-	-

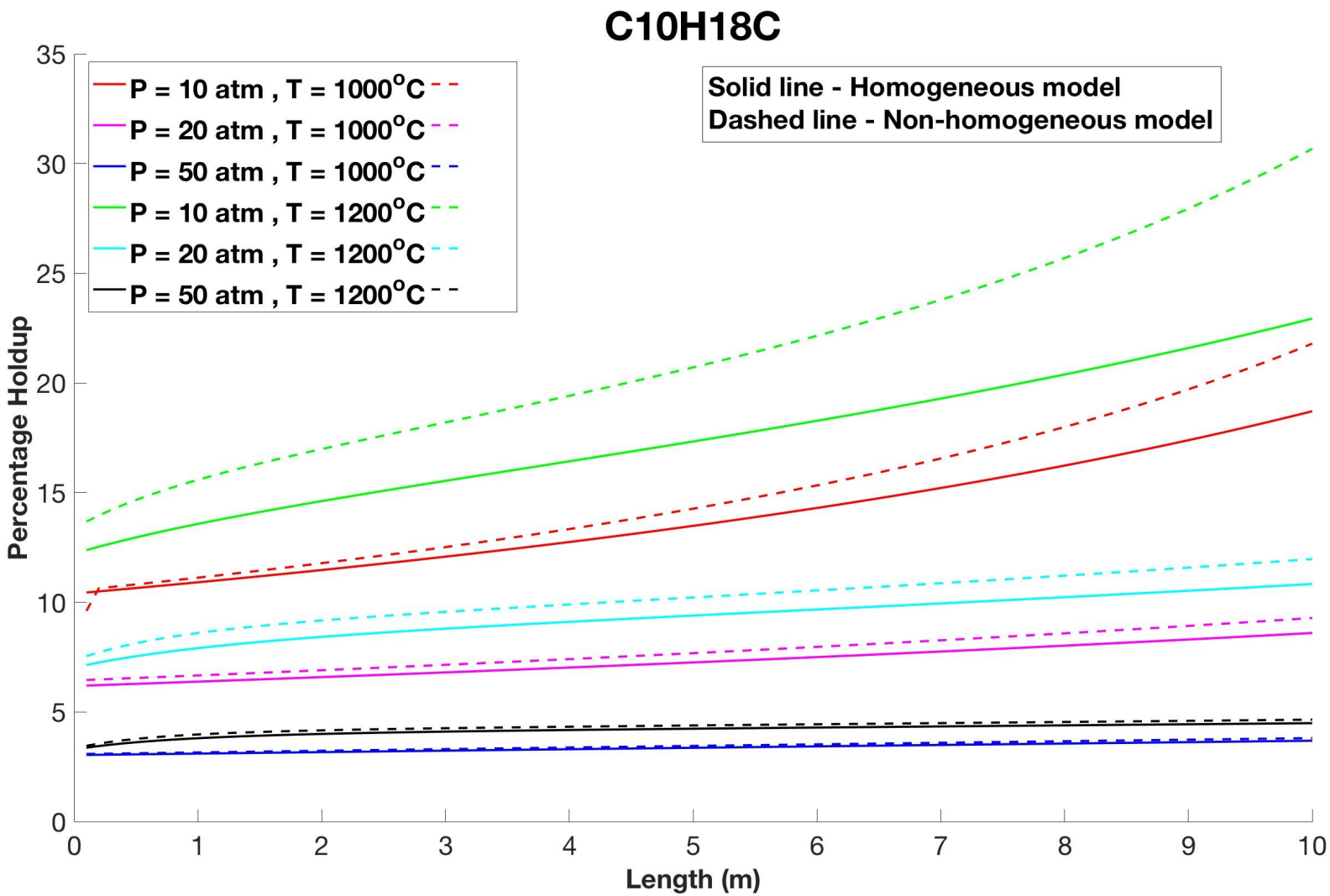
Aromatic Mass Balance Error = 2.1235%

H_2 per kg fuel = 0.1217 kg H_2 / kg Fuel

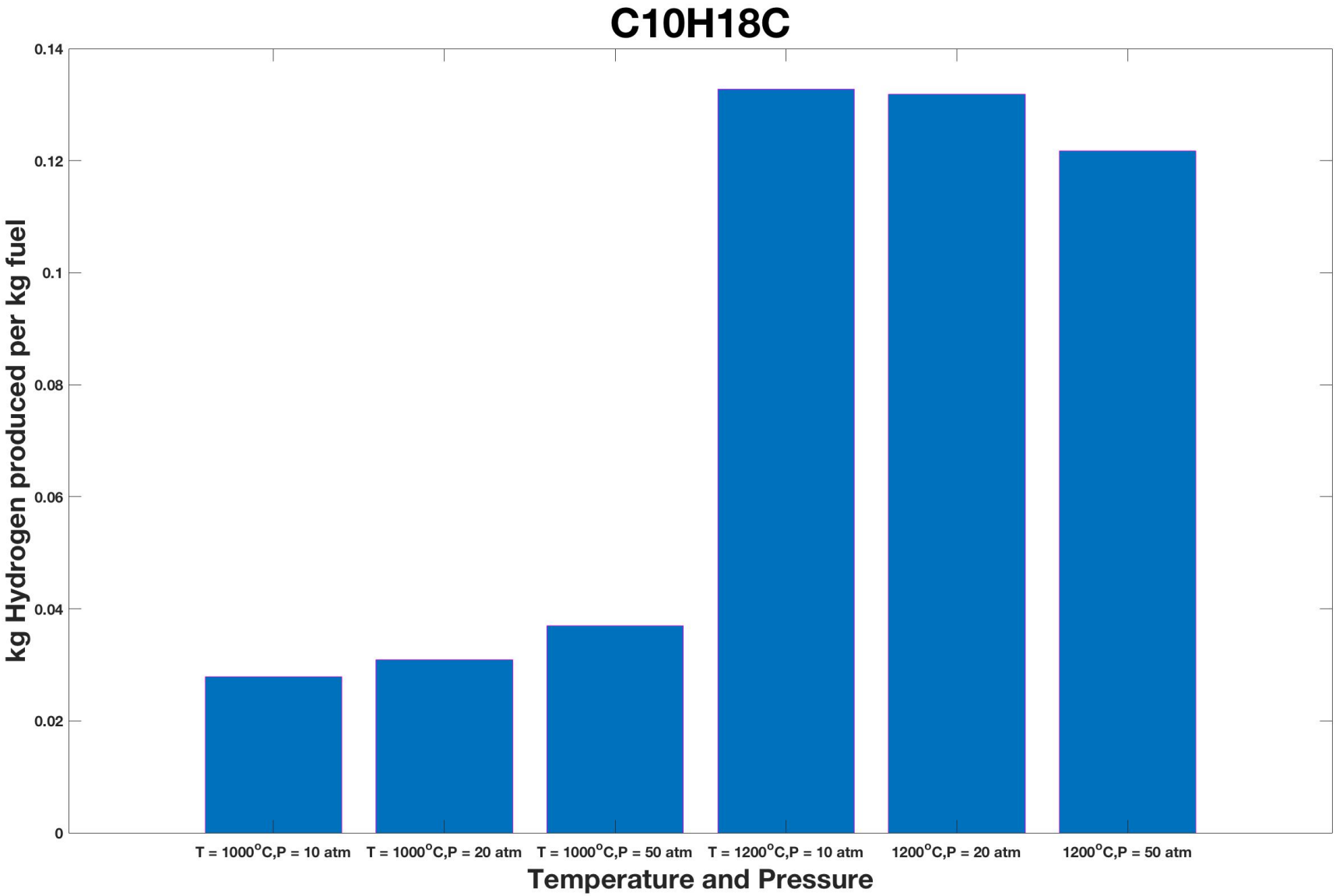
Total Mass In = 3.8314 kg/s

Total Mass Out = 3.8691 kg/s

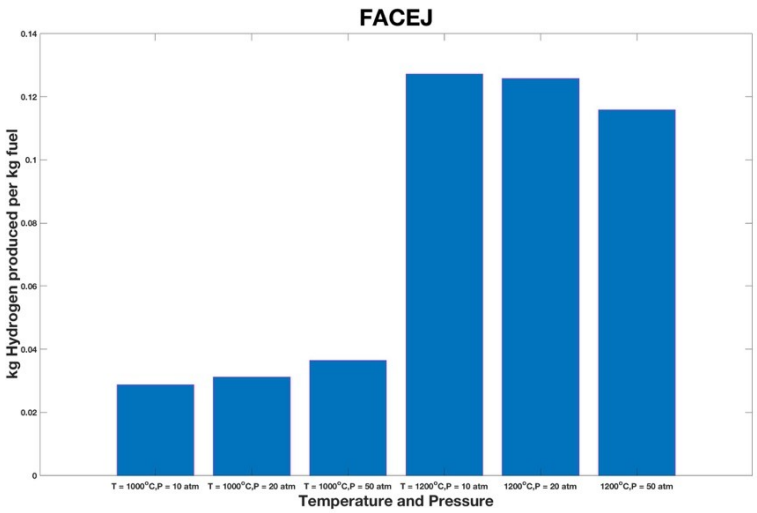
GAS HOLDUP PLOTS

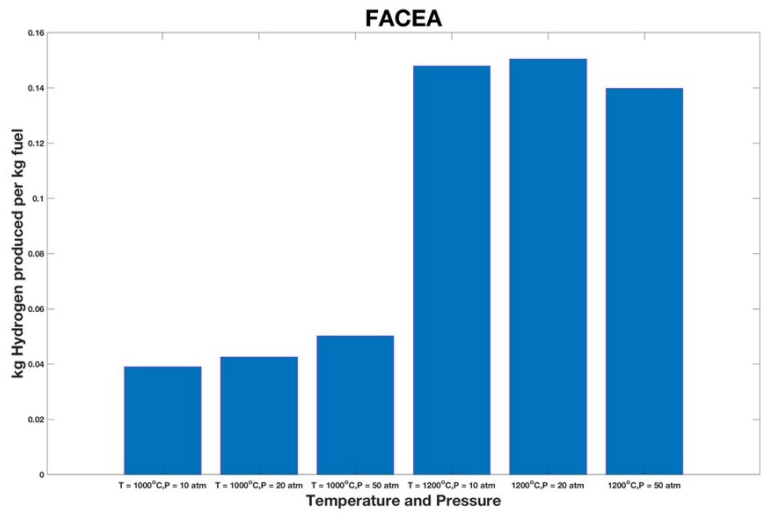


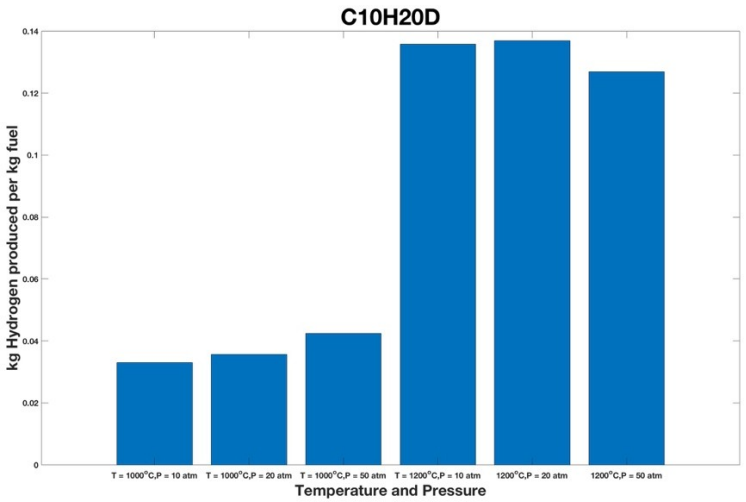
Hydrogen produced per kg Fuel

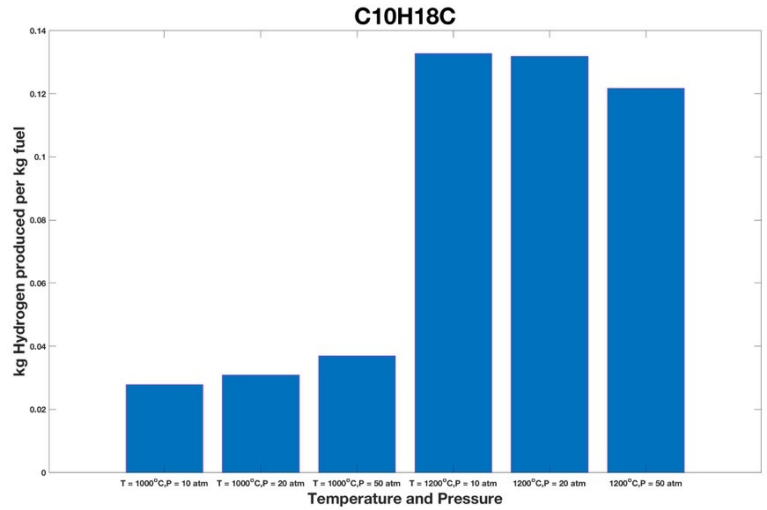


Hydrogen produced per kg input Fuel Comparison









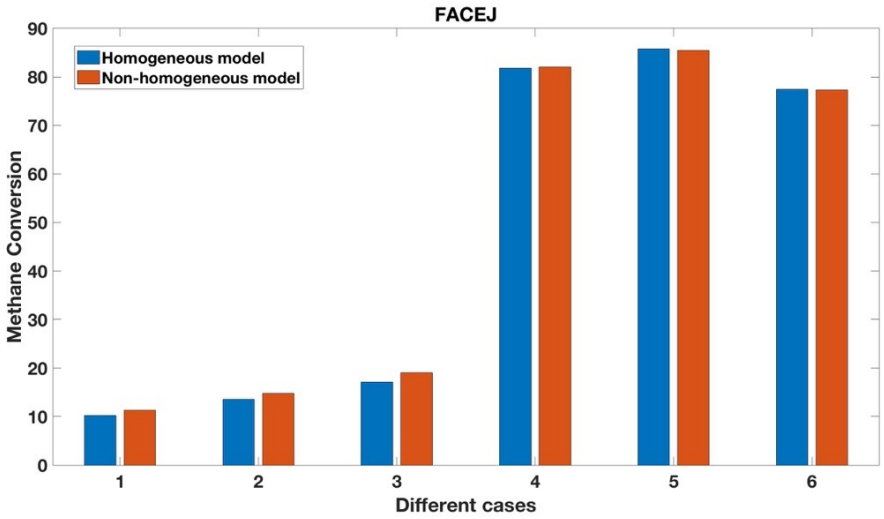
COMPARISON BETWEEN HOMOGENEOUS AND NON-HOMOGENEOUS MODELS

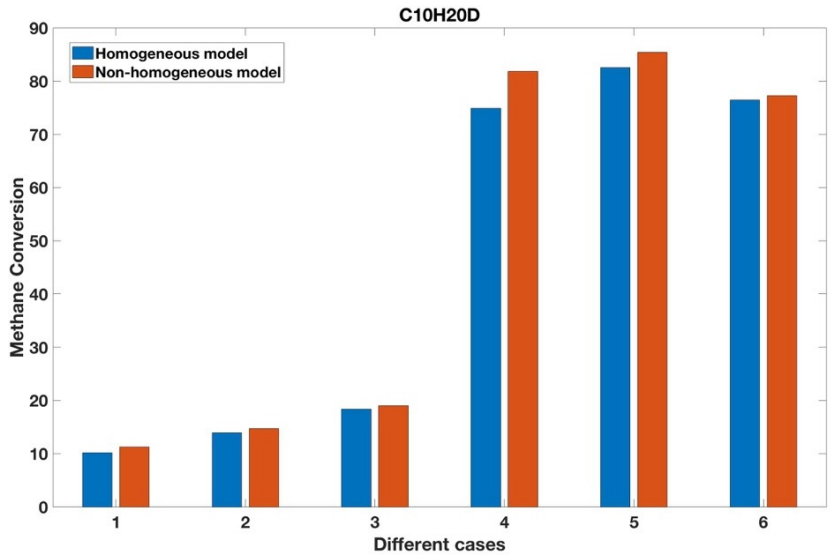
FACEJ		METHANE CONVERSION (%)	HYDROGEN PRODUCED (%)	RESIDENCE TIME (S)
T = 1000ºC P = 10 atm	Homogeneous	10.2928	20.5856	22.4160
	Non-Homogeneous	11.3290	22.6580	145.0175
T = 1000ºC P = 20 atm	Homogeneous	13.5527	27.1054	69.8043
	Non-Homogeneous	14.7933	29.5866	387.4362
T = 1000ºC P = 50 atm	Homogeneous	17.1216	34.2432	209.0409
	Non-Homogeneous	19.0612	38.1224	10905
T = 1200ºC P = 10 atm	Homogeneous	81.7876	163.5752	12.7914
	Non-Homogeneous	82.0365	164.0730	79.4587
T = 1200ºC P = 20 atm	Homogeneous	85.7622	171.5244	39.6327
	Non-Homogeneous	85.4438	170.8876	217.7956
T = 1200ºC P = 50 atm	Homogeneous	77.4328	154.8656	129.7187
	Non-Homogeneous	77.3251	154.6502	647.3544

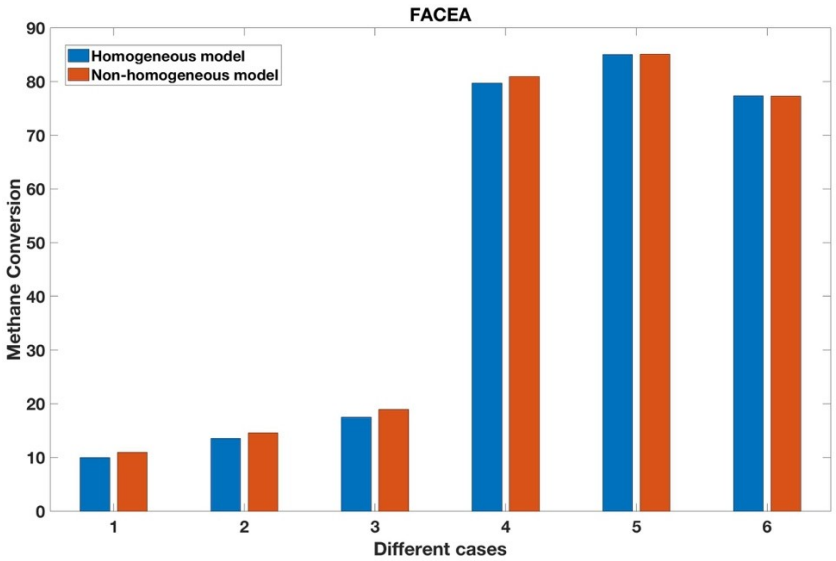
FACEA		METHANE CONVERSION (%)	HYDROGEN PRODUCED (%)	RESIDENCE TIME (S)
T = 1000ºC P = 10 atm	Homogeneous	9.9975	19.9950	15.9205
	Non-Homogeneous	10.9827	21.9654	98.8661
T = 1000ºC P = 20 atm	Homogeneous	13.5384	27.0768	46.9117
	Non-Homogeneous	14.5692	29.1384	287.0165
T = 1000ºC P = 50 atm	Homogeneous	17.5176	35.0352	137.8650
	Non-Homogeneous	18.9399	37.8798	715.3272
T = 1200ºC P = 10 atm	Homogeneous	79.6904	159.3808	10.1326
	Non-Homogeneous	80.9509	161.9018	60.7598
T = 1200ºC P = 20 atm	Homogeneous	84.9938	169.9876	29.3564
	Non-Homogeneous	85.1152	170.2304	160.1618
T = 1200ºC P = 50 atm	Homogeneous	77.3499	154.6998	92.3388
	Non-Homogeneous	77.2867	154.5734	466.9712

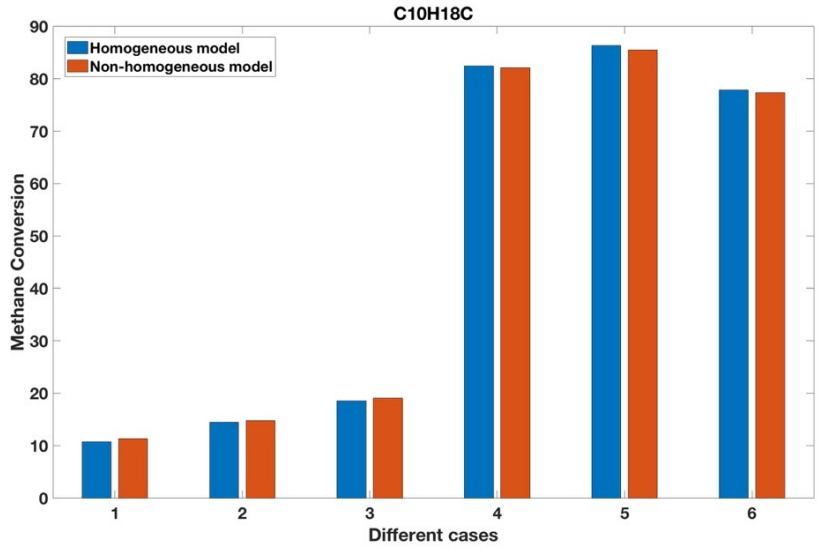
C10H20D		METHANE CONVERSION (%)	HYDROGEN PRODUCED (%)	RESIDENCE TIME (S)
T = 1000ºC P = 10 atm	Homogeneous	10.2070	20.4140	17.6988
	Non-Homogeneous	11.2655	22.5310	136.0940
T = 1000ºC P = 20 atm	Homogeneous	13.9749	27.9498	52.7092
	Non-Homogeneous	14.7530	29.5060	275.5774
T = 1000ºC P = 50 atm	Homogeneous	18.3768	36.7536	153.3272
	Non-Homogeneous	19.0395	38.0790	648.2573
T = 1200ºC P = 10 atm	Homogeneous	74.9078	149.8156	10.4389
	Non-Homogeneous	81.8518	163.7036	55.0926
T = 1200ºC P = 20 atm	Homogeneous	82.5670	165.1340	30.8020
	Non-Homogeneous	85.3881	170.7762	133.9921
T = 1200ºC P = 50 atm	Homogeneous	76.4410	152.8820	99.3774
	Non-Homogeneous	77.3184	154.6368	409.3260

C10H18C		METHANE CONVERSION (%)	HYDROGEN PRODUCED (%)	RESIDENCE TIME (S)
T = 1000ºC P = 10 atm	Homogeneous	10.7881	21.5762	17.5230
	Non-Homogeneous	11.3378	22.6756	134.3527
T = 1000ºC P = 20 atm	Homogeneous	14.4385	28.8770	52.3682
	Non-Homogeneous	14.7988	29.5976	273.4377
T = 1000ºC P = 50 atm	Homogeneous	18.5379	37.0758	154.4901
	Non-Homogeneous	19.0641	38.1282	651.9679
T = 1200ºC P = 10 atm	Homogeneous	82.4023	164.8046	10.6249
	Non-Homogeneous	82.0698	164.1396	56.6150
T = 1200ºC P = 20 atm	Homogeneous	86.3231	172.6462	31.6949
	Non-Homogeneous	85.4530	170.9060	82.0698
T = 1200ºC P = 50 atm	Homogeneous	77.8687	155.7374	102.2193
	Non-Homogeneous	77.3261	154.6522	419.5203


FACEJ
Homogeneous model
Non-homogeneous model
Methane Conversion
Different cases
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6


C10H20D
Homogeneous model
Non-homogeneous model
Methane Conversion
Different cases
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6


FACEA
Homogeneous model
Non-homogeneous model
Methane Conversion
Different cases
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6


C10H18C
Homogeneous model
Non-homogeneous model
Methane Conversion
Different cases
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6