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APPENDIX

Experiment Data

Table A1 The effect of operating parameter on reactant conversions (under conditions: a HC_s/O₂ feed molar ratio of 2/1 and electrode gap distance of 10 mm)

Conditions					Reactant conversion (%)				
Voltage ^a	Frequency ^b	Feed flow rate ^c	Steam ^d	Ni loading	CH ₄	C ₂ H ₆	C ₃ H ₈	CO ₂	O ₂
6.6	500	100	-	-	5.49	7.45	11.46	2.50	10.11
9					11.80	16.23	22.93	4.99	18.08
12					15.71	21.54	29.98	9.40	23.50
15					17.22	25.48	35.68	7.95	24.38
18					15.82	28.29	37.67	7.74	26.00
21					15.71	29.36	41.25	7.37	26.56
15	300	100	-	-	21.66	45.35	58.88	1.82	41.61
	400				15.82	29.68	41.51	3.70	24.32
	500				17.22	25.48	35.68	7.95	24.38
	600				14.99	19.69	27.70	10.24	21.75
15	300	50	-	-	26.20	49.92	61.61	0.37	47.90
		75			22.21	48.18	63.18	0.55	46.34
		100			21.66	45.35	58.88	1.82	41.61
		125			20.33	41.08	51.99	0.20	37.69
		150			18.29	35.57	46.57	1.06	30.48
15	300	75	-	-	22.21	48.18	63.18	0.55	46.34
			5		24.71	48.55	61.40	0.22	44.39
			10		25.46	49.11	61.93	2.10	44.72
			15		27.38	50.50	62.23	1.80	45.02
			20		23.68	44.41	57.59	2.28	42.14
15	300	75	15	Al ₂ O ₃	35.46	51.74	60.62	12.21	47.86
				5 wt%	37.62	54.57	61.54	6.82	60.95
				7 wt%	38.20	57.59	66.36	4.57	62.14
				10 wt%	45.16	70.83	76.31	23.14	87.72

Note:

- a = unit in kV
- b = unit in Hz
- c = unit in cm³/min
- d = unit in mol%

Table A2 The effect of operating parameter on product yields (under conditions: a HC_s/O₂ feed molar ratio of 2/1 and electrode gap distance of 10 mm)

Conditions					Product yields (mol%)					
Voltage ^a	Frequency ^b	Feed flow rate ^c	Steam ^d	Ni loading	H ₂	CO	C ₂ H ₄	C ₃ H ₆	C ₄ H ₁₀	CO ₂
6.6	500	100	-	-	19.73	4.22	0.25	0.00	0.68	-
9					35.21	13.94	0.86	0.09	2.19	-
12					43.53	21.49	1.52	0.21	3.80	-
15					50.32	24.07	2.73	0.35	3.76	-
18					51.59	25.49	4.14	0.43	2.99	-
21					53.29	27.81	5.00	0.47	2.57	-
15	300	100	-	-	71.13	44.29	6.06	0.61	4.59	-
	400				53.47	24.63	4.09	0.44	2.93	-
	500				50.32	24.07	2.73	0.35	3.76	-
	600				41.25	19.55	1.30	0.17	3.57	-
15	300	50	-	-	75.44	52.28	5.59	0.39	4.20	-
		75			74.85	47.50	6.62	0.60	4.25	-
		100			71.13	44.29	6.06	0.61	4.59	-
		125			65.46	38.76	4.90	0.46	3.90	-
		150			60.02	32.42	4.29	0.44	3.74	-
15	300	75	-	-	74.85	47.50	6.62	0.60	4.25	-
			5		75.94	47.37	6.17	0.53	4.76	-
			10		76.68	49.17	5.97	0.50	5.11	-
			15		77.82	51.97	5.36	0.44	5.32	-
			20		71.85	43.74	5.72	0.51	4.84	-
15	300	75	15	Al ₂ O ₃	84.55	56.80	3.64	0.40	7.64	-
				5 wt%	88.77	62.47	2.26	0.32	2.80	-
				7 wt%	92.95	64.50	3.04	0.36	3.25	-
				10 wt%	112.53	70.22	0.35	0.12	0.03 - 9.05	-

Note:

a = unit in kV

b = unit in Hz

c = unit in cm³/min

d = unit in mol%

Table A3 The effect of operating parameter on product selectivities (under conditions: a HCs/O₂ feed molar ratio of 2/1 and electrode gap distance of 10 mm)

Conditions					Product selectivities (%)					
Voltage ^a	Frequency ^b	Feed flow rate ^c	Steam ^d	Ni loading	H ₂	C ₂ H ₄	CO	C ₃ H ₆	C ₄ H ₁₀	CO ₂
6.6	500	100	-	-	80.87	0.94	15.69	0.02	2.52	-
9			68.92		1.77	24.84	0.18	4.29	-	
12			64.65		2.12	28.01	0.27	4.95	-	
15			64.12		3.28	27.84	0.40	4.35	-	
18			62.98		4.78	28.43	0.48	3.34	-	
20.5			61.62		5.50	29.64	0.50	2.74	-	
15	300	100	-	-	56.48	4.78	34.67	0.48	3.60	-
	400		62.78		4.80	28.58	0.50	3.34	-	
	500		64.12		3.28	27.84	0.40	4.35	-	
	600		66.02		1.97	26.87	0.23	4.90	-	
15	300	50	-	-	54.73	4.13	37.82	0.28	3.04	-
		75			56.00	5.00	35.39	0.44	3.16	-
		100			56.48	4.78	34.67	0.48	3.60	-
		125			57.69	4.38	34.10	0.41	3.43	-
		150			59.72	4.23	31.94	0.43	3.68	-
15	300	75	-	-	56.00	5.00	35.39	0.44	3.16	-
			5		56.36	4.62	35.10	0.39	3.53	-
			10		56.15	4.35	35.46	0.36	3.68	-
			15		55.52	3.82	36.60	0.31	3.75	-
			20		57.15	4.51	34.17	0.39	3.78	-
15	300	75	15	Al ₂ O ₃	57.20	2.28	35.49	0.25	4.77	-
				5 wt%	57.74	1.41	38.91	0.20	1.74	-
				7 wt%	57.33	1.82	38.69	0.22	1.95	-
				10 wt%	58.51	0.18	36.51	0.06	0.02	4.70

Note:

- a = unit in kV
- b = unit in Hz
- c = unit in cm³/min
- d = unit in mol%

Table A4 The effect of operating parameter on ratios and power consumption under conditions: a HCs/O₂ feed molar ratio of 2/1 and electrode gap distance of 10 mm)

Conditions					Ratio		Power Consumption	
Voltage ^a	Frequency ^b	Feed flow rate ^c	Steam ^d	Ni Catalysts	H ₂ /CO	H ₂ /C ₂ H ₄	A ^e	B ^f
6.6	500	100	-	-	5.15	86.18	28.91	9.42
9					2.77	38.86	19.46	11.74
12					2.31	30.44	16.97	12.75
15					2.30	19.54	14.39	11.18
18					2.22	13.17	16.36	13.04
20.5					2.08	11.20	17.67	14.05
15	300	100	-	-	1.63	11.81	12.65	10.30
	400				2.24	13.07	14.27	10.52
	500				2.30	19.54	14.54	11.61
	600				2.46	33.48	17.67	12.82
15	300	50	-	-	1.45	13.26	13.14	10.92
		75			1.58	11.21	12.63	10.07
		100			1.63	11.81	12.65	10.30
		125			1.69	13.18	13.91	10.74
		150			1.87	14.11	15.55	11.56
15	300	75	-	-	1.58	11.21	12.63	10.07
			5		1.61	12.20	12.35	10.52
			10		1.58	12.91	12.05	10.38
			15		1.52	14.52	11.50	10.03
			20		1.67	12.67	13.75	11.67
15	300	75	15	Al ₂ O ₃	1.61	25.13	10.54	9.45
				5 wt%	1.48	40.99	10.73	9.23
				7 wt%	1.48	31.49	10.32	8.59
				10 wt%	1.60	317.31	8.98	6.16

Note:

a = unit in kV

b = unit in Hz

c = unit in cm³/min

d = unit in mol%

e = unit in eV per mlc reactant converted

f = unit in eV per mlc hydrogen produced

CURRICULUM VITAE

Name: Ms. Wasamon Ngamkala

Date of Birth: July 31, 1989

Nationality: Thai

University Education:

2008 – 2011 Bachelor Degree of Engineering, Petrochemical and Polymeric Materials, Department of Material Science and Engineering, Faculty of Engineering and Industrial Technology, Silpakorn University, Thailand

Proceeding:

1. Ngamkala, W.; Pornmai, K. and Chavadej, S. (2014, April 22) Steam Reforming of CO₂-Containing Natural Gas with Partial Oxidation on Ni Catalyst in a Corona Discharge System for Syngas Production. Proceedings of the 5th Research Symposium on Petrochemical and Materials Technology and the 20th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.