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APPENDICES
APPENDIX A
ASSUMPTION, DEFINITION, AND CALCULATIONS

In this work, the following assumptions were made:

1. All the gaseous behaviors obey the ideal gas law
2. The change in the system, pressure is very small and negligible.
3. The pressure in the system equals the atmospheric pressure (1 atm)

The total molar flow rate of the gaseous stream can be determined from the following equation:

$$N = q \times (P/RT) \qquad (B.1)$$

where

q = total volumetric flow rate

P = total pressure of the system

R = gas constant (82.051 atm·ml·mol^{-1}·min^{-1}·K)

T = absolute ambient temperature (K)

The molar flow rate of each component can be obtained by multiplying its fraction derived from the gas chromatography analysis by the total molar flow rate.

The conversion is defined as:

$$\% \text{ Conversion} = \frac{\text{Mole reactant in} - \text{Mole reactant out}}{\text{Mole reactant in}} \times 100 \qquad (B.2)$$

The selectivity is defined as:

$$\% \text{ Selectivity} = \frac{P \times \text{Mole of } C_p \text{ produced}}{R \times \text{Mole of } C_R \text{ converted}} \times 100 \qquad (B.3)$$

where

P = number of carbon atom in product

R = number of carbon atom in reactant

C_p = product that has carbon P atom

C_R = reactant that has carbon R atom

APPENDIX B

EXPERIMENTAL DATA

Table B.1 Effect of total gas flow rate at power of 3.5 W, frequency of 400 Hz, Gap of 10 mm, and O_2: C_2H_4 ratio of 5:1

Flow Rate	% Conversion		%Selectivity				% Carbon	Current (A)
(ml/min)	O_2	C_2H_4	CO	CO_2	CH_4	C_2H_6	balance	
20	47.40	98.20	32.61	65.55	u	u	93.24	0.129
40	54.94	97.58	37.79	59.79	u	u	91.74	0.164
60	52.57	93.25	44.11	48.71	0.47	u	90.31	0.162
80	40.29	87.74	44.45	42.32	1.11	0.28	90.68	0.165

u = under GC detection limit

Table B.2 Effect of frequency at power of 3.5 W, gap of 10 mm, total gas flow rate of 40 ml/min, and O_2: C_2H_4 ratio of 5:1

Frequency (Hz)	% Conversion		%Selectivity		% Carbon balance	Current (A)
	O_2	C_2H_4	CO	CO_2		
200	53.68	96.23	35.36	64.64	100.0	0.129
300	51.28	94.11	38.78	61.22	99.17	0.164
400	54.94	97.58	38.73	61.27	91.74	0.166
500	51.46	95.96	39.68	60.32	97.53	0.169

Table B.3 Effect of power at frequency of 200 Hz, gap of 10 mm, total gas flow rate of 40 ml/min, and O_2: C_2H_4 ratio of 5:1

Frequency (Hz)	% Conversion		%Selectivity		% Carbon balance	Current (A)
	O_2	C_2H_4	CO	CO_2		
3.5	48.73	95.54	41.78	58.22	97.45	0.143
4.2	60.00	100.00	29.91	70.09	97.30	0.205
4.8	55.75	98.23	22.26	77.74	102.48	0.259
5.1	56.71	98.42	20.24	79.76	101.81	0.304

Table B.4 Effect of TiO_2 loading on glass wool at power of 3.5 and 4.2 W, frequency of 200 Hz, gap of 10 mm, total gas flow rate of 40 ml/min, and O_2: C_2H_4 ratio of 5:1

Power (W)	TiO_2 loading (mg)	% Conversion		%Selectivity		% Carbon balance	Current (A)
		O_2	C_2H_4	CO	CO_2		
3.5	0	48.73	95.54	41.78	58.22	97.45	0.143
	1.4	55.08	100	28.64	71.36	94.83	0.133
	10.4	55.38	100	30.37	69.63	95.01	0.211
4.2	0	60.00	100	29.91	70.09	97.30	0.205
	2	55.52	100	24.80	75.20	98.47	0.269
	18.2	56.56	100	23.61	76.39	97.5	0.312

Table B.5 Effect of gap at power of 3.5 W, frequency of 200 Hz, total gas flow rate of 40 ml/min, and O_2: C_2H_4 ratio of 5:1

Gap (mm)	% Conversion		%Selectivity		% Carbon balance	Current (A)
	O_2	C_2H_4	CO	CO_2		
4	34.26	74.68	62.07	37.93	93.96	0.184
6	38.92	76.26	52.77	47.21	96.39	0.176
8	46.42	87.55	47.52	52.48	92.26	0.145
10	48.73	95.54	41.78	58.22	97.46	0.143

Table B.6 Effect of gap at power of 3.5 W, frequency of 200 Hz, gap of 10 mm, total gas flow rate of 40 ml/min, O_2: C_2H_4 ratio of 5:1, and TiO_2 of 1.2-1.5 mg

Gap (mm)	TiO_2 (mg)	% Conversion		%Selectivity		% Carbon balance	Current (A)
		O_2	C_2H_4	CO	CO_2		
4	1.2	38.43	79.56	49.74	50.26	96.53	0.316
6	1.5	34.86	85.02	41.28	58.72	96.03	0.294
8	1.3	46.42	87.55	44.79	55.22	92.64	0.183
10	1.4	55.08	100.00	28.64	71.36	94.83	0.133

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