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APPENDICES

Appendix –A: Temperature profiles summary of gasifier zones

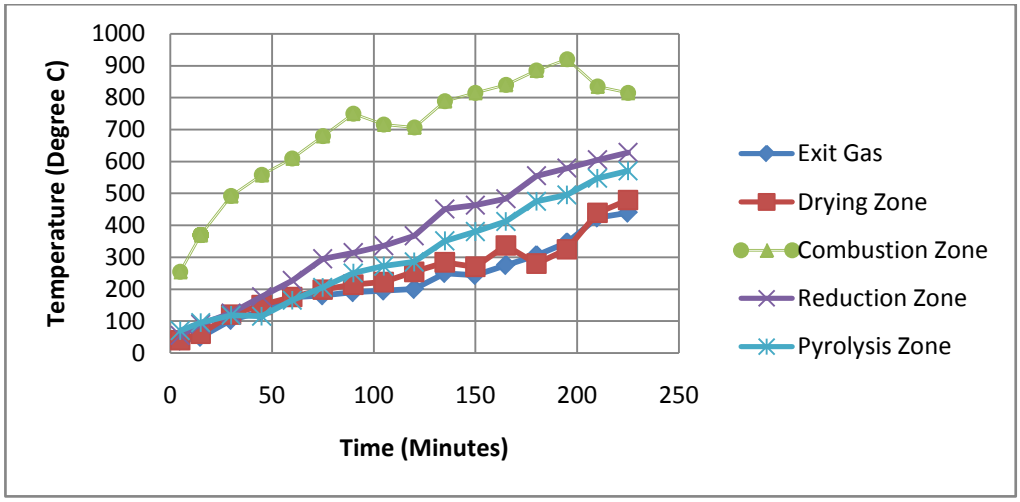

Figure. A-1: Temperature profile of different zones of gasifier for coconut shell

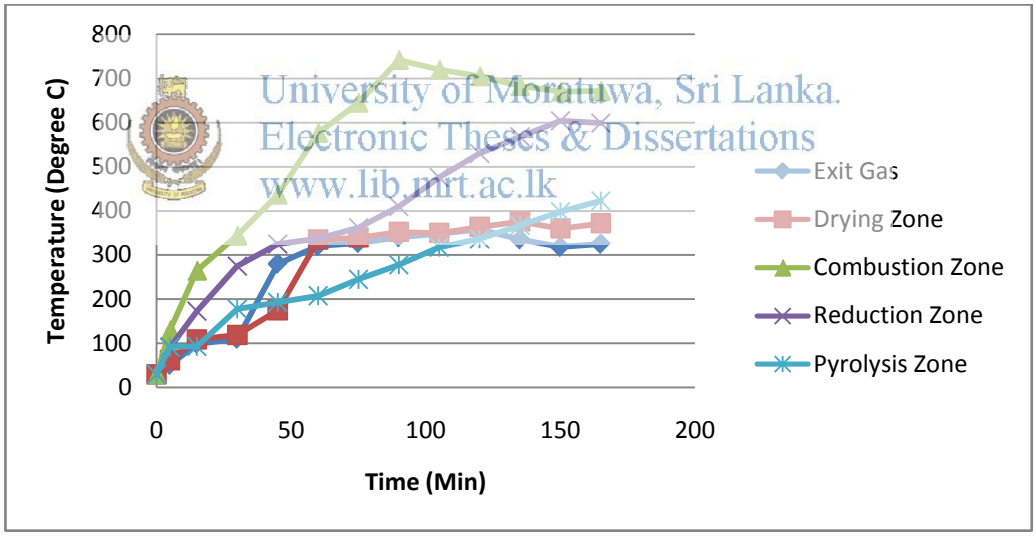

Figure. A-2: Temperature profile of different zones of gasifier for Mango Pit Shell

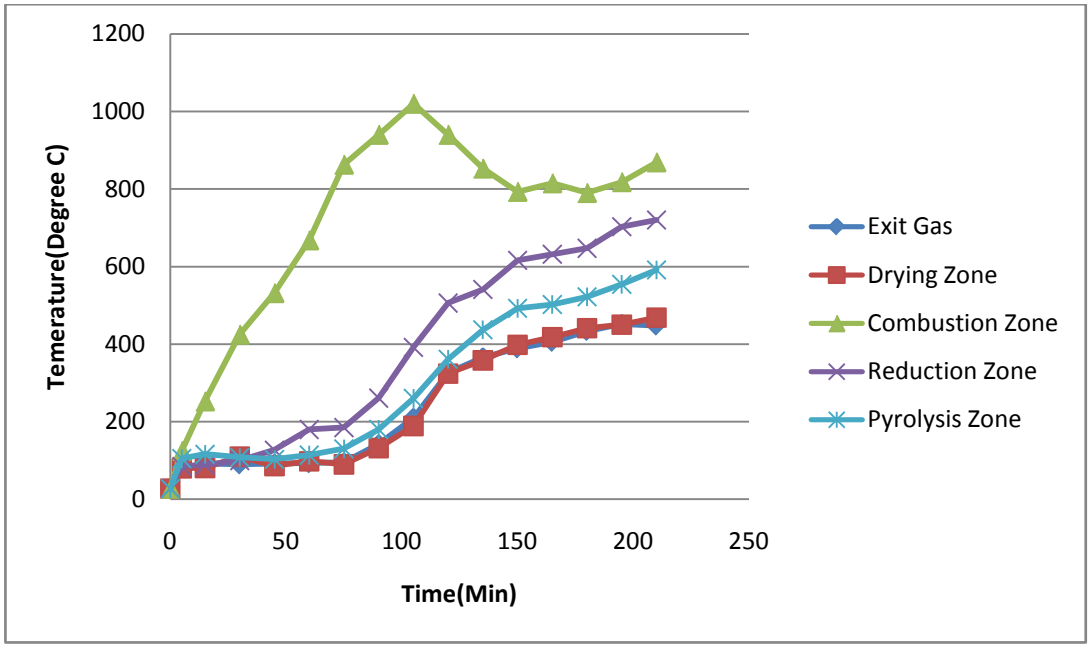

Figure. A-3: Temperature profile of different zones of gasifier for Ginisyria

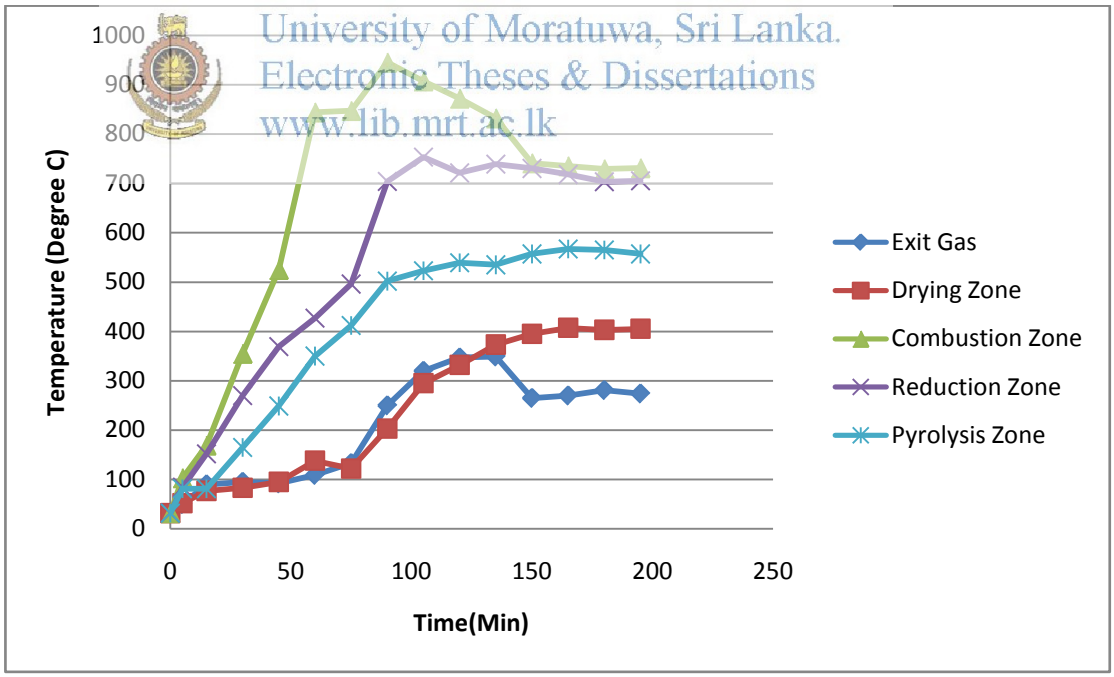

Figure. A-4: Temperature profile of different zones of gasifier for Mixture

Appendix –B : Elemental analysis results detail

Table B-1: Tabulated results of moisture contents of biomass feed stock

Sample	Weight of sample(gm)	Weight of Empty Crucible (gm)	Weight of crucible with sample before drying (gm)	Weight after drying in oven (gm)	Moisture removed (gm)	%by wt. of Moisture removed
Mango Pit	5	16.10	21.10	20.25	0.85	17
Coconut Shell	5	15.39	20.39	19.85	0.54	10.8
Ginisyria	5	15.63	20.63	19.95	0.68	13.6
Mixture	5	36.50	41.05	40.47	0.58	11.6

Table B-2: Tabulated results of ash contents of biomass feed stock

Sample	Weight of sample(gm)	Weight of Empty Crucible (gm)	Weight of crucible with sample	Weight after taking from muffle furnace	Wt of ash (gm) (wt after muffle-wt of empty)	% of ash by wt.
Mango Pit	5	19.21	24.21	19.28	0.07	1.4
Coconut Shell	5	19.63	24.63	20.24	0.61	12.2
Ginisyria	5	19.61	24.61	19.91	0.3	6
Mix	5	19.19	24.19	19.57	0.38	7.6

Table B-3: Volatile matters determination of different biomass

Sample	Weight of sample(gm)	Weight of Empty Crucible (gm)	Weight of crucible with sample	Weight after taking from muffle furnace	Loss in weight
Mango Pit	5.0	26.17	31.17	26.98	4.19
Coconut Shell	5.0	21.58	26.58	22.79	3.79
Ginisyria	5.0	26.16	31.16	27.11	4.05
Mix	5.0	21.58	26.58	22.46	4.12

Volatile Matters percentage calculated according to this formula

$$VM\% = \frac{\text{loss in weight on ignition} - \text{loss in weight from moisture}}{\text{Weight of sample}} \times 100$$

Volatile Matter on dry ash free basis %

$$VM_{daf}\% = \frac{\text{loss in weight on ignition} - \text{loss in weight from moisture}}{\text{Weight of sample} - (\text{Calculated wt. of ash} + \text{calculated wt. of moisture})} \times 100$$

Table B-4: Volatile matters of different biomass

Property	Coconut shell	Mango Shell	Ginisyria	Mixture
Volatile Matter %	65	67	67.4	70.8
Volatile Matter on dry ash free basis %	84.4	81.9	83.8	87.6

Table B-5: Fixed carbon of different biomass

Property	Coconut shell	Mango Shell	Ginisyria	Mixture
Fixed Carbon %	19.08	11.06	14.63	11.21

Table B-6: Moisture Contents on dry basis of different biomass

Sr.No	Component	Moisture content on Dry Basis (%)
1	Mango Shell	14.52
2	Coconut Shell	9.74
3	Ginisyria	11.97
4	Mixture	10.39

I. Moisture content on dry basis

Formula: $MC_w x100/MC_w+100$ [42]

1. Mango shell : 17x100/17+100= 1700/117 =14.52%
2. Coconut shell: 10.8x100/10.8+100= 1080/110.8 =9.74%
3. Ginisyria : 13.6x100/13.6+100= 1360/113.6 =11.97%
4. Mixture : 11.6x100/11.6+100=1160/111.6 = 10.39%

II. Fixed carbon Calculation (volatile matters % basis)

Formula =100-(Moisture % +Ash %+ Volatility %)

1. Mango Pit= 100-(14.52+1.4+65) =19.08
2. Coconut shell= 100-(9.74+12.2+67) =11.06
3. Ginisyria=100-(11.97+6+67.4) =14.63
4. Mixture= 100-(10.39+7.6+70.80) =11.21

III. Calculation of Wt. percent of carbon in the fuel

C%= DMMFC+0.9(DMMFVOL-14)x(vol+FC)/100

a. Mango Pit : 22.6+0.9(77.3-14)x(84.08)/100 =48.1
b. Coconut shell= 14.1+0.9(85.83-14)x(78.06)/100=50.6
c. Ginisyria = 17.83+0.9(82.16-14)x(82.03)/100 =50.4
d. Mixture= 13.66+0.9(86.33-14)x(82.01)/100 =53.52

IV. Calculation of percentage of nitrogen in the fuel

N_2%= ((2.1-0.012xDMMFVOL)x(VOL+FC)/100

a. Mango Pit= (2.1-0.012x77.3)x(84.08)/100 = 0.98
b. Coconut shell= (2.1-0.012x85.83)x(78.06)/100 = 0.83
c. Ginisyria= (2.1-0.012x82.16)x(82.03)/100 =0.911
d. Mixture =(2.1-0.012x86.33)x(82.01)/100 =0.87

V. Calculation of percentage of hydrogen in fuel

H_2% =(DMMFVOLx7.35/DMMFVOL+10)-0.013x(VOL+FC)

a. Mango Pit= (77.3x7.35/77.3+10)-0.013(84.08)= 6.50-1.09= 5.41
b. Coconut= (85.83x7.38/85.83+10)-0.013(78.06) = 6.609-1.014 = 5.6

c. GINISYRIA= (82.16x7.35/82.16+10)-0.013(82.03)= 6.55-1.066= 5.48

d. Mixture= (86.33x7.35/86.33+10)-0.013(82.01)= 6.586-1.066 =5.52

Percentage of O_2 in Fuel: Formula: 100- Ash-S-H_2-C-Moisture-N_2