Chapter 5

Conclusion and Recommendations

5.1 Conclusion

The highest Modulus of rupture (MOR) was obtained for most suitable composition for the cookware when fired at 1250 ^{0}C. It was found to have maximum of 74 MPa. The required strength of the cookware bodies were achieved with the composition.

The body containing 45% of clay, 15% of talc, 15% of alumina and 25% of zircon fired at 1250^{0}C showed the lower coefficient of thermal expansion and high thermal shock resistance. Based on these properties it can be suggested that the above composition could be effectively used to manufacture ceramic cookware application.

It can be concluded that the selected body composition cookware applications contains 45% of clay, 15% of talc, 15% of alumina and 25% of zirconium silicate. Further the body having a coefficient of thermal expansion of 30.20x10^{-7}/^{0}C and thermal shock resistance parameter of 0.74 kJm^{-1}s^{-1}.

5.2 Suggestions for future work

The following can be suggested for further investigation;

1. It could be investigated that if it is possible to improve the appearance of the cookware body by glazing or decorating. Since the finish on cookware permit easy cleaning of the container, there should be no crevice or rough surfaces inside the pot that cannot be readily cleaned.
2. It could be verified the cookware is safe for microwave cooking and refrigerator usage.

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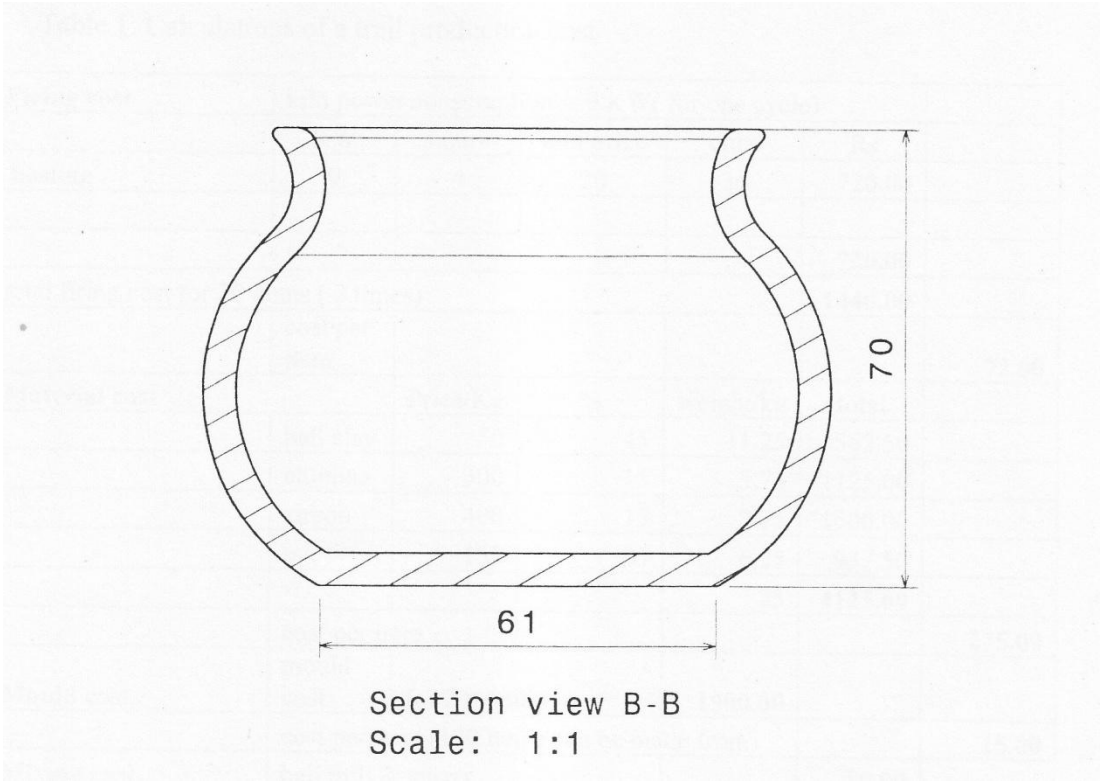
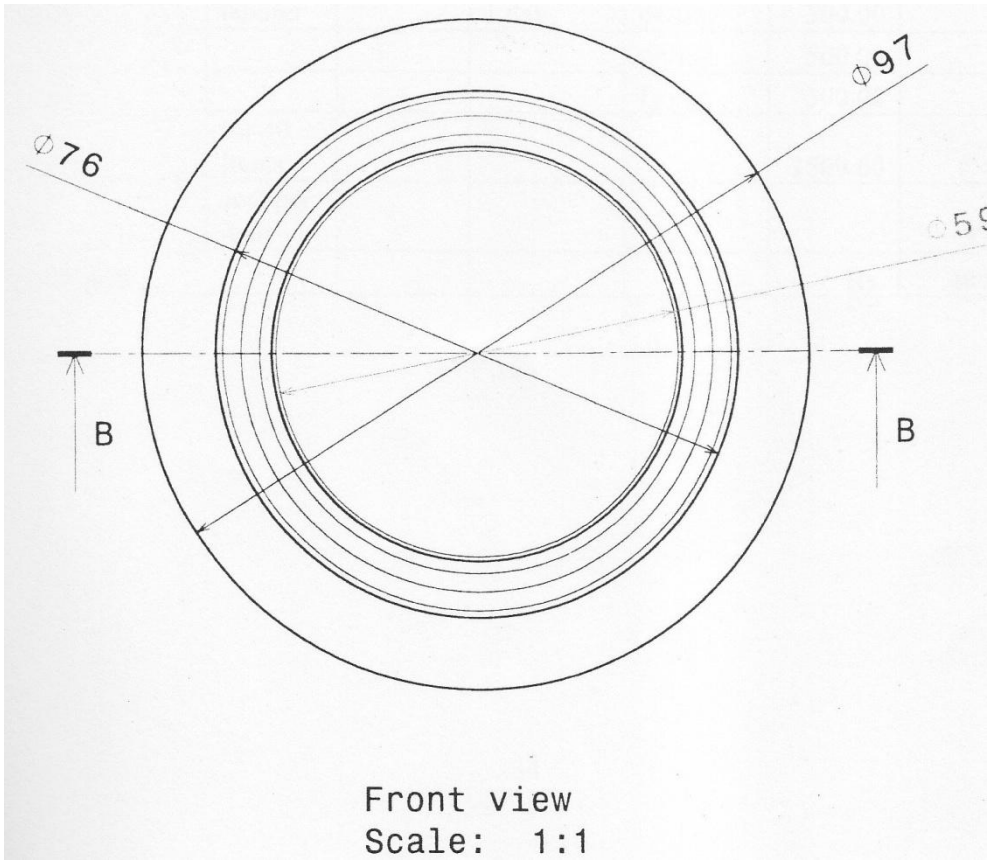
Appendix A: Drawings of sample cookware





Appendix B: Cost calculation for a trial production cost

Table 1: Calculations of a trial production cost considering twenty items.

Firing cost	kiln power consumption is 9 KW(for one cycle)					
	KW	hours	unit price	units	Rs	
heating	9	4	20	36	720.00	
					720.00	
total firing cost for 20 items (2 times)					**1440.00**	
	cost per item					**72.00**
Material cost		Price/Kg	%	weight/kg	total	
	ball clay	50	45	11.25	562.50	
	alumina	300	15	3.75	1125.00	
	zircon	400	15	3.75	1500.00	
	talc	150	25	6.25	937.50	
				25	**4125.00**	
	cost per item					**206.00**
Mould cost	mould cost	for 2 moulds		**1500.00**		
	cost per item (100 items can be made from)					**15.00**
Mixing cost	ball mill & stirrer				**50.00**	
	cost per item					**10.00**
Labour cost	one laborer		1 day	slip casting	500.00	
				drying	500.00	
				firing	500.00	
	for 40 Items				**1500.00**	
	cost per item					**37.00**
Cost for one item					**Rs.**	**340.00**

Appendix C

Table 2: Technical data sheets of the raw materials – Sri Lanka Ball clay

TECHNICAL DATA SHEET – SRI LANKA BALL CLAYS

Location - Dediyawela
Type – Yellow Ball Clay

Particle size
Percentage retained on 300 BSS
(+53 microns) ..... 0.9 %

Modulus of Rupture 21.2 kg/cm^2
(extruded bars dried at 110°C)

Linear Shrinkage (dry to fired)

1150°C	1200°C	11250°C
12.5	15.5	17.5

Chemical Analysis

SiO_2	44.38%
Al_2O_3	35.78%
TiO_2	2.32%
Fe_2O_3	2.16%
CaO	0.22%
Mgo	0.52%
K_2O	0.77%
Na_2O	0.12%
L O I	13.74%

ESD Microns	Percentage (finer)
53	99.1%
20	98.0%
10	97.0%
8	96.0%
2	87.0%
1	70.0%
0.8	66.0%
0.5	50.0%

Rheological Properties
deflocculant demand = 0.7%
(solid content of the slip 46%)
(deflocculant - Sodium Silicate C - 140)

Linear Shrinkage
(Wet - Dry)
(at 26% moisture)
4.0

Water Absorption

1150°C	1200°C	11250°C
11.0	3.6	1.0

Whiteness

1150°C	1200°C	11250°C
63.0	60.0	50.5

Refractoriness
1720°C

LOCATION – DEDIYAWELA
TYPE – BLUE BALL CLAY

PARTICLE SIZE
Percentage retained on
300 BSS
(+53 microns) 0.3%

Modulus of Rupture
23.8 kg/cm^2

(extruded bars dried at 110°C)

LINEAR SHRINKAGE
(dry to fired)

1150°C	1200°C	1250°C
15.2	19.0	19.5

CHEMICAL ANALYSIS

SiO_2	44.45%
Al_2O_3	36.77%
TiO_2	1.73%
Fe_2O_3	1.97%
CaO	0.24%
Mgo	0.52%
K_2O	0.74%
Na_2O	0.12%
L O I	13.46%

ESD microns	Percentage (finer)
53	99.7%
20	98.5%
10	97.5%
8	96.5%
2	89.5%
1	79.0%
0.8	75.0%
0.5	62.0%

RHEOLOGICAL PROPERTIES
deflocculant demand = 1.2%
(solid content of the slip 46%)

(deflocculant - Sodium Silicate C - 140)

LINEAR SHRINKAGE
(Wet - Dry)
(at 26% moisture)
4.8

WATER ABSORPTION

1150°C	1200°C	1250°C
7.0	1.10	0.2

Whiteness

1150°C	1200°C	1250°C
64.0	62.0	53.5

REFRACTORINESS
1700°C

CRDC – 1988 – HERATH (1990) – CRDC

Table 3: Technical data sheets of the raw materials – Talc

Wet Milled Fired Talc 水磨烧滑石

Item	Chemical component analysis								
	K_2O	Na_2O	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	CaO	MgO	Loss
JFT	0.38	0.12	62.26	0.36	0.04	0.04	4.16	28.31	0.23