REFERENCES:

[1] Yan, L., Chouw, N., Experimental study of flex FRP tube enclosed coir fibre reinforced concrete composite column, Construction and Building Materials, 1118-1127, 40, 2013.

[2] Satyanarayana, K.G., Kulkarni, A.G., Rohatgi, P.G., Structure and properties of coir fibres, Regional Research Laboratory, Trivandrum, 695 019.

[3] Available at:http://www.matbase.com/material/fibres/natural/coir/properties, (Accessed on 2011/02/26)

[4] Narendar, R., Dasan, K. P., Nair, M., Development of coir pith/nylon fabric/epoxy hybrid composite: Mechanical and ageing studies, Materials and Design, 644-651, 54, 2014.

[5] Romli, F. I., Alias, A. Z., Rafie, A. S. M., Majid, D. L. A. A., Factorial study on the tensile strength of a coir fiber rainforced epoxy composite, AASRI Procdia, 242-247, 3, 2012.

[6] Available at:http://www.wbdg.org/design/midg_materials.php, (Accessed on 2011/03/01)

[7] Available at:http://www.sager.ch/images/upload/Prospekt_Saglan_e_729.pdf, (Accessed on 2011/02/15)

[8] Zhang, L., Hu, Y., Novel lignocellulosic hybrid particlesboard composites made from rice straws and coir fibers, Materials and Design, 19-26, 55, 2014.

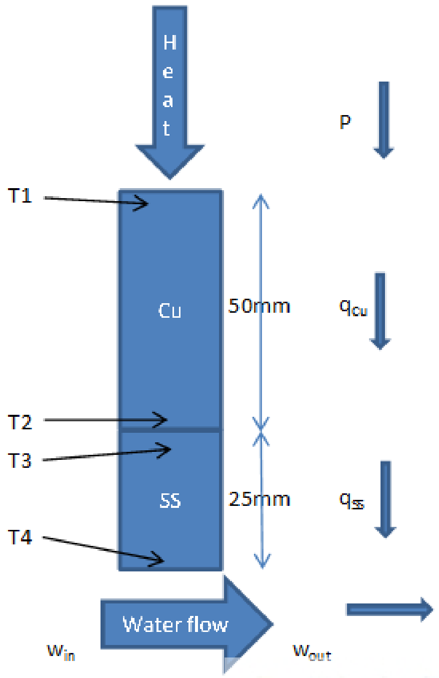
[9] Fouladi, M. H., Nor, M. J. M., Ayub, M. D., Leman, Z. A., Utilization of coir fiber in multilayer acoustic absorption panel, Applied Acoustics, 241-249, 71, 2010.

[10] Liu, M. Y. J., Alengaram, U. J., Jumaat, M. Z., Mo, K. H., Evaluation of thermal conductivity mechanical and transport properties of lightweight aggregate foamed geopolymer concreate, Energy and Buildings, 238-245, 72, 2014.

[11] Brasileiro, G. A. M., Viera, J. A. R., Barreto, L. S., Use of coir pith particles in composites with portland cement, Journal of Environmental Management, 228-238, 131, 2013.

APPENDICES:

6.1 APPENDIX 01: (Method of calculation-calibration of setup)



$P = V \times I$

Rate of heat flow across the specimen:

$q_{Cu} = K_a \times A_a \times (T_1 - T_2)/L_a$

$q_{ss} = K_b \times A_b \times (T_3 - T_4)/L_b$

$q_w = \dot{m} \times C \times (T_{wo} - T_{wi})$

$q_w = q_{Cu} = q_{ss}$

$K_{Cu} = [\dot{m} \times C \times (T_{wo} - T_{wi}) \times La] / [A_a(T1-T2)]$

$K_{SS} = [\dot{m} \times C \times (T_{wo} - T_{wi}) \times Lb] / [A_b(T3-T4)]$

$d_{Cu} = d_{SS}$ =	25 mm	
L_{Cu} =	50 mm	0.05 m
L_{SS} =	25 mm	0.025 m
$\dot{m}$ =	25 l/hr=	25 kg/hr
$A_{Cu} = A_{SS}$ =	0.00049 m^2	
C =	4180 J/kg.K	
(Two-Twi) =	^oC	
$(T_1 - T_2)$ =	^oC	
$(T_3 - T_4)$ =	^oC	
K_{Cu} =		
K_{SS} =		

Figure A.1: Heat flow configuration

The notations used are follows:

- q : Heat flow rate
- K : Thermal conductivity (W/m K)
- A : Cross sectional area of the specimen (0.000491m^2)
- T : Temperature (^oC)
- L : Length of the specimen (m)
- C : Specific heat capacity of water (4180J/kg K)
- $\dot{m}$: Water flow rate (25kg/hr or 25/3600 kg/s)
- Diameter (Cu) = 25mm
- Diameter (SS) = 25mm

The calculations are done for all the specimens according to the above equations.

6.2 APPENDIX 02: (Values for SS and Cu specimens)

Table A.1: Experiment 1: Apparatus calibration

	Time (s)	**Temperature Values (^oC)**					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	171	162	131	75	28.5	29.5
2	150	175	164	133	77	28.5	29.5
3	300	178	168	136	78	28.5	29.5
4	450	180	171	138	79	28.5	29.5
5	600	183	174	141	79	28.5	29.5
Average		177.4	167.8	135.8	77.6	28.5	29.5
Thermal conductivity of Cu = 307.915 W/m K							
Thermal conductivity of SS = 25.395 W/m K							

Table A.2: Experiment 2: Apparatus calibration

	Time (s)	**Temperature Values (^oC)**					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	164	152	132	92	30	31
2	150	167	155	135	94	30	31
3	300	168	157	137	94	30	31
4	450	172	158	136	92	30	31
5	600	173	160	137	93	30	31
Average		168.8	156.4	135.4	93	30	31
Thermal conductivity of Cu = 238.386 W/m K							
Thermal conductivity of SS = 34.858 W/m K							

Table A.3: Experiment 3: Apparatus calibration

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	180	165	145	100	29.5	30.5
2	150	182	167	148	102	29.5	30.5
3	300	183	169	148	102	29.5	30.5
4	450	184	170	149	103	29.5	30.5
5	600	185	172	150	104	29.5	30.5
Average		182.8	168.6	148	102.2	29.5	30.5
Thermal conductivity of Cu = 208.167 W/m K Thermal conductivity of SS = 32.27 W/m K							

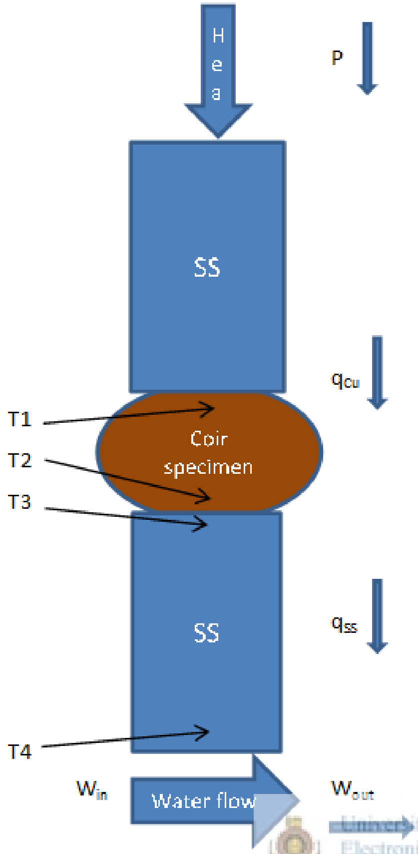
Table A.4: Experiment 4: Apparatus calibration

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	182	168	148	104	28.5	30
2	150	184	171	149	105	28.5	30
3	300	186	173	151	106	28.5	30
4	450	188	174	152	106	28.5	30
5	600	189	175	154	107	28.5	30
Average		185.8	172.2	150.8	105.6	28.5	30
Thermal conductivity of Cu = 326.027 W/m K Thermal conductivity of SS = 49.048 W/m K							

Table A.5: Experiment 5: Apparatus calibration

	Time (s)	**Temperature Values (^oC)**					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	181	167	144	98	28	29.5
2	150	183	169	146	102	28	29.5
3	300	185	171	148	103	28	29.5
4	450	187	173	149	104	28	29.5
5	600	188	175	151	105	28	29.5
Average		184.8	171	147.6	102.4	28	29.5
Thermal conductivity of Cu = 321.302 W/m K Thermal conductivity of SS = 49.048 W/m K							

6.3 APPENDIX 03: (Method of calculation-initial experiments)



$P = V \times I$

Rate of heat flow across the specimen:

$q_{Coir} = K_a \times A_a \times (T_1 - T_2)/L_a$

$q_{ss} = K_b \times A_b \times (T_3 - T_4) / L_b$

$q_w = \dot{m} \times C \times (T_{wo} - T_{wi})$

$q_w = q_{Coir} = q_{ss}$

$K_{Coir} = [\dot{m} \times C \times (T_{wo} - T_{wi}) \times La] / [A_a(T1-T2)]$

$K_{SS} = [\dot{m} \times C \times (T_{wo} - T_{wi}) \times Lb] / [A_b(T3-T4)]$

$d_{Coir} = d_{SS}$ =	25 mm	
L_{Coir} =	? mm	
L_{SS} =	25 mm	
$\dot{m}$ =	25 l/hr	25 kg/hr
$A_{coir} = A_{ss}$ =	0.000491 m^2	
C	4180 J/kg.K	
(Two-Twi) =	^oC	
(T1-T2) =	^oC	
(T3-T4) =	^oC	

K_{Coir} =

Figure A.2: Heat flow configuration

The notations used are follows:

- q : Heat flow rate
- K : Thermal conductivity (W/m K)
- A : Cross sectional area of the specimen (0.000491m^2)
- T : Temperature (^oC)
- L : Length of the specimen (m)
- C : Specific heat capacity of water (4180J/kg K)
- $\dot{m}$: Water flow rate (25kg/hr or 25/3600kg/s)
- Diameter (Coir) = 25 mm
- Diameter (SS) = 25mm

The calculations are done for all the specimens according to the above equations.

6.4 APPENDIX 04: (Results for initial experiments)

Table A.6: Experiment 6: Thermal conductivity measuring of specimen 1

	Time (s)	Temperature Values (^{o}C)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	165	91	59	49	29	29.5
2	150	174	94	61	50	29	29.5
3	300	182	99	62	51	29	29.5
4	450	188	104	63	52	29	29.5
5	600	195	110	65	52	29	29.5
Average		180.8	99.6	62	50.8	29	29.5
Thermal conductivity of SS = 65.981 W/m K Thermal conductivity of coir = 6.967 W/m K							

Table A.7: Experiment 7: Thermal conductivity measuring of specimen 2

	Time (s)	Temperature Values (^{o}C)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	197	103	68	51	29	30
2	150	202	110	70	52	29	30
3	300	207	116	75	54	29	30
4	450	214	121	80	55	29	30
5	600	219	127	88	56	29	30
Average		207.8	115.4	76.2	53.6	29	30
Thermal conductivity of SS = 65.397 W/m K Thermal conductivity of coir = 10.287 W/m K							

Table A.8: Experiment 8: Thermal conductivity measuring of specimen 3

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	178	120	79	63	28	28.5
2	150	185	127	84	67	28	28.5
3	300	195	137	92	77	28	28.5
4	450	198	141	95	75	28	28.5
5	600	204	147	101	81	28	28.5
6	750	210	153	106	88	28	28.5
Average		195	137.5	92.83	75.16	28	28.5
Thermal conductivity of SS = 41.829 W/m K Thermal conductivity of coir = 10.123 W/m K							

Table A.9: Experiment 9: Thermal conductivity measuring of specimen 4

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	198	120	91	88	25.5	26
2	150	205	125	97	78	25.5	26
3	300	212	139	104	81	25.5	26
4	450	217	141	110	95	25.5	26
5	600	223	141	115	91	25.5	26
6	750	227	153	121	101	25.5	26
Average		213.6	136.5	106.3	89	25.5	26
Thermal conductivity of SS = 42.634 W/m K Thermal conductivity of coir = 5.969 W/m K							

6.5 APPENDIX 05: (Thermal conductivity values for 1, 2 & 3 specimens)

Table A.10: Experiment 10: Thermal conductivity neasuring of specimen 1

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	80	67	53	46	29	29.2
2	150	82	69	55	48	29	29.2
3	300	84	72	57	48	29	29.2
4	450	85	74	57	48	29	29.2
5	600	85	75	57	48	29	29.2
Average		83.2	71.4	55.8	47.6	29	29.2

Table A.11: Experiment 11: Thermal conductivity measuring of specimen 2

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	78	64	52	45	29	29.2
2	150	79	65	52	46	29	29.2
3	300	81	68	53	46	29	29.2
4	450	82	70	55	47	29	29.2
5	600	84	72	55	47	29	29.2
Average		80.8	67.8	53.4	46.2	29	29.2

Table A.12: Experiment 12: Thermal conductivity measuring of specimen 3

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	82	69	52	47	29	29.2
2	150	82	72	53	47	29	29.2
3	300	85	74	55	48	29	29.2
4	450	86	75	55	48	29	29.2
5	600	87	77	57	49	29	29.2
Average		84.4	73.4	54.4	47.8	29	29.2

6.6 APPENDIX 06: (Thermal conductivity values for 9, 11 & 12 specimens)

Table A.13: Experiment 13: Thermal conductivity measuring of specimen 9

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	90	78	59	50	29.3	29.5
2	150	92	79	61	51	29.3	29.5
3	300	93	80	62	51	29.3	29.5
4	450	95	81	62	52	29.3	29.5
5	600	97	82	63	52	29.3	29.5
Average		93.4	80	61.4	51.2	29.3	29.5

Table A.14: Experiment 14: Thermal conductivity measuring of specimen 11

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	79	67	52	47	29.3	29.5
2	150	81	68	54	48	29.3	29.5
3	300	84	72	57	50	29.3	29.5
4	450	86	74	57	51	29.3	29.5
5	600	88	76	58	52	29.3	29.5
Average		83.6	71.4	55.6	49.6	29.3	29.5

Table A.15: Experiment 15: Thermal conductivity measuring of specimen 12

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	81	67	55	48	29.3	29.5
2	150	83	69	57	49	29.3	29.5
3	300	84	72	57	50	29.3	29.5
4	450	86	74	58	51	29.3	29.5
5	600	87	75	60	51	29.3	29.5
Average		84.2	71.4	57.4	49.8	29.3	29.5

6.7 APPENDIX 07: (Thermal conductivity values for glass wool)

Table A.16: Experiment 16: Thermal conductivity measuring for glass wool

	Time (s)	Temperature Values (^oC)					
		T_1	T_2	T_3	T_4	$T_{w,in}$	$T_{w,out}$
1	0	75	65	58	50	28.8	29
2	150	76	66	59	50	28.8	29
3	300	78	68	60	51	28.8	29
4	450	79	68	62	52	28.8	29
5	600	80	69	62	52	28.8	29
Average		77.6	67.2	60.2	51	28.8	29
Thermal conductivity of Glass Wool = 6.426 W/m K Thermal conductivity of SS = 34.107 W/m K							

6.8 APPENDIX 08: (Critical thickness calculation for coir fibre insulation)

The following calculations are used to calculate the thermal conductivity at each thickness of coir fibre insulation in order to find out the critical thickness of the coir fibre insulation.

First allow ice to dissolve in water. Then temperature of water comes to a minimum and ice is totally dissolved. After that, temperature of water will increased by acquiring heat from environment. In this case heat is transfer through coir and beaker materials. I measured time period from minimum temperature of water to maxim recorded. I have plotted Time Vs Temperature curves of water in beaker for each and every sample. By these plots we can find time period of heat transfer and increase of temperature of water.

$$\textbf{Heat gain from the water after ice is melt}$$

$$= \textbf{Heat flow through the insulation and the Pyrex wall of the beaker.}$$

$$\boldsymbol{Q\ dot} = \frac{\boldsymbol{k} \times \boldsymbol{A} \times \boldsymbol{\Delta T}}{\boldsymbol{l}} = \frac{\boldsymbol{m} \times \boldsymbol{C} \times \boldsymbol{\Delta\theta}}{\boldsymbol{t}}$$

Where;

Q dot - Rate of heat transfer

k - Thermal conductivity of coir insulation

A - Area of the cross sectional area of heat transfer of the beaker

l - Thickness of the heat transfer medium

ΔT - Temperature difference across the insulation (in ^oC)

m - Mass of water [ρ (Density) × V (Volume)]

C - Specific heat capacity of water

$\Delta\theta$ - Temperature rise of water (in ^oC)

t - Time period

Table A.17: Values of the variables

Variable	Calculation
Q dot	Need not to be calculated
k	Value to be calculated
A	$\left[\frac{\pi}{4} \times 0.085^2 \times 2\right] + [\pi \times 0.085 \times 0.07] = \mathbf{0.03005}$ m^2 0.085m-Diameter of the Beaker 0.07m-Height of the Beaker
l	Varies as 1+0.4cm, 2+0.4cm, 3+0.4cm, 4+0.4cm and 5+0.4cm (+0.4cm is thickness of Beaker material)
ΔT	$85^oF - \Delta t_{min}$ (85^oF is Atmospheric Temperature)
m	$400 \times 10^{-6} \times 1000 = 0.4$kg
C	$4.1813 \times 10^3 = 4181.3 J^oC^{-1}kg^{-1}$
$\Delta\theta$	$T_{water, final} - T_{water, min} = T_1 - T_2$

Then the equation simplifies to;

$$\frac{k \times 0.03005 \times (85 - T)}{l} = 0.4 \times 4181.3 \times \left(\frac{\Delta\theta}{t}\right)$$

$$\frac{k}{l} = \frac{0.4 \times 4181.3 \times \left(\frac{\Delta\theta}{t}\right)}{0.03005 \times \left[85 - \left(\frac{T1 + T2}{2}\right)\right]}$$

For the first specimen;

$$\frac{k}{0.014} = \frac{0.4 \times 4181.3 \times (48 - 43.5)/(38 \times 60)}{0.03005 \times \left[85 - \left(\frac{48 + 43.5}{2}\right)\right]}$$

$$\boldsymbol{k = 0.0391 \text{ W/m K}}$$

For the second specimen;

$$\frac{k}{0.024} = \frac{0.4 \times 4181.3 \times (67.5 - 62.5)/(38 \times 60)}{0.03005 \times \left[85 - \left(\frac{67.5 + 62.5}{2}\right)\right]}$$

$$\boldsymbol{k = 0.1464 \text{ W/m K}}$$

For the third specimen;

$$\frac{k}{0.034} = \frac{0.4 \times 4181.3 \times (63 - 56.5)/(36 \times 60)}{0.03005 \times [85 - \left(\frac{63 + 56.5}{2}\right)]}$$

$$\boldsymbol{k = 0.2255\ \mathbf{W/m\ K}}$$

For the fourth specimen;

$$\frac{k}{0.044} = \frac{0.4 \times 4181.3 \times (51 - 45)/(44 \times 60)}{0.03005 \times [85 - \left(\frac{51 + 45}{2}\right)]}$$

$$\boldsymbol{k = 0.1504\ \mathbf{W/m\ K}}$$

For the fifth specimen;

$$\frac{k}{0.054} = \frac{0.4 \times 4181.3 \times (49 - 43.5)/(51 \times 60)}{0.03005 \times [85 - \left(\frac{49 + 43.5}{2}\right)]}$$

$$\boldsymbol{k = 0.1394\ \mathbf{W/m\ K}}$$

Heat transfer through the wall of the beaker and the coir insulation:

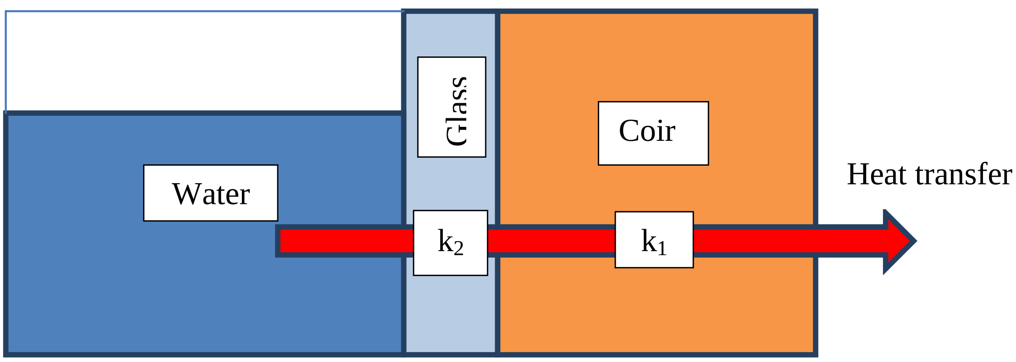


Figure A.3: Heat transfer direction

$$Thermal\ resistivity = \frac{l}{k \times A}$$

$$\frac{l}{k \times A} = \frac{l1}{k1 \times A} + \frac{l2}{k2 \times A}$$

$$\frac{l}{k} = \frac{l1}{k1} + \frac{l2}{k2}$$

Thermal conductivity of Pyrex glass (k2) = 1.005W/m K

$$\frac{l}{k} = \frac{l1}{k1} + \frac{0.004}{1.005}$$

For the first specimen:

$$\frac{0.014}{\mathbf{0.0391}} = \frac{0.01}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.028\ \mathrm{W/m\ K}}$$

For the second specimen:

$$\frac{0.024}{\mathbf{0.1464}} = \frac{0.02}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.125\ \mathrm{W/m\ K}}$$

For the third specimen:

$$\frac{0.034}{\mathbf{0.2255}} = \frac{0.03}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.204\ \mathrm{W/m\ K}}$$

For the fourth specimen:

$$\frac{0.044}{\mathbf{0.1504}} = \frac{0.04}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.138\ \mathrm{W/m\ K}}$$

For the fifth specimen:

$$\frac{0.054}{\mathbf{0.1394}} = \frac{0.05}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.130\ \mathrm{W/m\ K}}$$

Heat transfer values for each insulation mat:

$$\boldsymbol{Q\ dot = \frac{k * A * \Delta t}{l}}$$

Table A.18: Table of thermal conductivity values obtained

No. of the specimen	Thickness of the insulation	Thermal Conductivity	Heat transfer rate through the coir insulation
01	1cm	0.0283	3.23W
02	2cm	0.125	7.14W
03	3cm	0.204	7.37W
04	4cm	0.138	4.58W
05	5cm	0.130	3.99W

6.9 APPENDIX 09: (Analysis of performance of insulation mat with coir pith)

The following calculations are used to calculate the thermal conductivity at each thickness of coir fibre insulation in order to find out the optimum coir pith amount.

First, allow ice to dissolve in water. Then temperature of water comes to a minimum and ice is totally dissolved. After that, temperature of water will increased by acquiring heat from environment. In this case heat is transfer through coir and beaker materials. I measured time period from minimum temperature of water to maxim recorded. I have plotted Time Vs Temperature curves of water in beaker for each and every sample. By these plots we can find time period of heat transfer and increase of temperature of water.

Heat gain from the water after ice is melt

= Heat flow through the insulation and the Pyrex wall of the beaker.

$$Q\ dot = \frac{k \times A \times \Delta t}{l} = \frac{m \times C \times \Delta \theta}{t}$$

Where;

$Q\ dot$	- Rate of heat transfer
k	- Thermal conductivity of coir insulation
A	- Area of the cross sectional area of heat transfer of the beaker
l	- Thickness of the heat transfer medium
ΔT	- Temperature difference across the insulation (in ^oF)
m	- Mass of water [ρ (Density) × V (Volume)]
C	- Specific heat capacity of water
$\Delta\theta$	- Temperature rise of water (in ^oF)
t	- Time period

Table A.19: Values of the variables

Variable	Calculation
Q dot	Need not to be calculated
k	Value to be calculated
A	$\left[\frac{\pi}{4} \times 0.085^2 \times 2\right] + [\pi \times 0.085 \times 0.07] = \mathbf{0.03005}$ m^2 0.085m-Diameter of the Beaker 0.07m-Height of the Beaker
l	1cm
Δt	85^{o}F - Δt_{min}
m	$400 \times 10^{-6} \times 1000 = \mathbf{0.4}$kg
C	$4.1813 \times 10^3 = \mathbf{4181.3}$J^{o}C^{-1}kg^{-1}
$\Delta\theta$	$T_{water,\ final} - T_{water,\ min} = T_1 - T_2$

Then the equation simplifies to;

$$\frac{k \times 0.0206 \times (85 - t)}{0.014} = 0.4 \times 4181.3 \times \left(\frac{\Delta\theta}{t}\right)$$

$$k = \frac{0.014 \times 0.4 \times 4181.3 \times \left(\frac{\Delta\theta}{t}\right)}{0.03005 \times \left[85 - \left(\frac{T1 + T2}{2}\right)\right]}$$

For the first specimen;

$$k = \frac{0.014 \times 0.4 \times 4181.3 \times (52 - 42.5)/(49 \times 60)}{0.03005 \times \left[85 - \left(\frac{52 + 42.5}{2}\right)\right]}$$

$$\boldsymbol{k = 0.0667\ \mathrm{W/m\ K}}$$

For the second specimen;

$$k = \frac{0.014 \times 0.4 \times 4181.3 \times (57 - 46)/(51 \times 60)}{0.03005 \times \left[85 - \left(\frac{57 + 46}{2}\right)\right]}$$

$$\boldsymbol{k = 0.0836\ \mathrm{W/m\ K}}$$

For the third specimen;

$$k = \frac{0.014 \times 0.4 \times 4181.3 \times (50.5 - 43)/(39 \times 60)}{0.03005 \times [85 - \left(\frac{50.5 + 43}{2}\right)]}$$

$$\boldsymbol{k = 0.0653 \ \mathrm{W/m\ K}}$$

For the fourth specimen;

$$k = \frac{0.014 \times 0.4 \times 4181.3 \times (50 - 44.5)/(41 \times 60)}{0.03005 \times [85 - \left(\frac{50 + 44.5}{2}\right)]}$$

$$\boldsymbol{k = 0.0461 \ \mathrm{W/m\ K}}$$

$$Thermal\ resistivity = \frac{l}{k \times A}$$

$$\frac{l}{k \times A} = \frac{l1}{k1 \times A} + \frac{l2}{k2 \times A}$$

$$\frac{l}{k} = \frac{l1}{k1} + \frac{l2}{k2}$$

Thermal conductivity of Pyrex glass (k2) = 1.005W/m K

$$\frac{l}{k} = \frac{l1}{k1} + \frac{0.004}{1.005}$$

For the first specimen:

$$\frac{0.014}{\mathbf{0.0667}} = \frac{0.01}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.0485 \mathrm{W/m\ K}}$$

For the second specimen:

$$\frac{0.014}{\mathbf{0.0836}} = \frac{0.01}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.0611 \ \mathrm{W/m\ K}}$$

For the third specimen:

$$\frac{0.014}{\mathbf{0.0653}} = \frac{0.01}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.0475}\ \mathbf{W/m\ K}$$

For the fourth specimen:

$$\frac{0.014}{\mathbf{0.0461}} = \frac{0.01}{k1} + \frac{0.004}{1.005}$$

$$\boldsymbol{k1 = 0.0334}\ \mathbf{W/m\ K}$$

The thermal conductivity values are tabulated in the following table.

Table A.20: Table of thermal conductivity values obtained

No. of the specimen	Coir pith ingredient	Thermal conductivity of the coir insulation
01	5g	0.0485 W/m K
02	10g	0.0611 W/m K
03	15g	0.0475 W/m K
04	20g	0.0334 W/m K