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. . . Y O U R   S C I E N T I F I C   S T A T I O N

22th June, 2022

Dear Client:
Below are the results of the analyses on the two samples (10 and 14) for their Thermal Conductivity, Heat Transfer Coefficient and Thermal Diffusivity.

Thank you for the patronage.
Lab. Technologist

Data of Temperatures for different time (seconds)

S/N	ID	T1	T2	T3	T4	T5	T6	T7	ΔT
1	10	34	35	35.4	35.9	36.6	37.3	37.8	3.8
2	14	33.9	35	35.4	36	36.5	36.8	37.1	3.2

Data for the Samples Dimension, power rating and Area of Samples

ID	Vol (ml)	Mass (g)	Density (g/ml)	V	I	Q	A=2*pi*rh	x
10	6.6	3.228	0.489091	0.1	0.95	0.095	0.00100544	0.01
14	3	1.766	0.588667	0.1	0.95	0.095	0.00100544	0.01

Thermal Conductivity & Diffusivity, Heat Transfer Coefficient and Specific heat

ID	λ = Q * x/(A*ΔT)	u = Q/(A*ΔT)	cp=Q/(m*ΔT)	α=λ/(ρ*cp)
10	0.248647358	24.86473584	0.007744734	65.6428904
14	0.295268738	29.52687381	0.016810589	29.8376661

Principle of measurement

Diffusivity is the rate of diffusion measured as the rate at which heat is spread on a material. The Thermal conductivity of the materials each with the specific heat capacity which were constant was measured using radial heat conduction apparatus (Armfield equipment model HT12) with heat transfer service unit (Armfield equipment model HT10XC

The probe consists of single heater wire and thermocouple. When constant electric power (energy) is given to the heater, the temperature of the wire will rise in exponential progression. Temperature rising with time line increases if the sample has less thermal conductivity, and decreases if it has higher TC. Therefore, TC of a sample can be determined from the rising temperature using the equation below.

Thermal Conductivity (TC)

$$\lambda = \frac{Q * x}{A\,(T2-T1)}$$

where;

; Thermal conductivity of sample [W/mK]

Q; generated heat per unit length of sample/time [W/m^2] Sample diameter = 0.0018 and length = 0.0043 [m]

X; Thickness of sample [m]

A; Area [m^2]

T0 and T5; Temperature at t0 and t5 [K]

t1 and t2; measured time length [second, s]

The general definition of the heat transfer coefficient is:

$$u = \frac{Q}{A * \Delta T}$$

Where;

Q: heat flux, W/m^2;

U: heat transfer coefficient, W/ (m^2•K)

ΔT: difference in temperature between the solid surface and surrounding fluid area, K

Specific heat capacity (c) = ___

Δ

Unit of C is J/kg*^{o}C, M is the Mass (kg), Q is change in energy (J), and ΔT is Temperature change (^{o}C)

Thermal Diffusivity α (m^2/s)

Thermal Diffusivity α (m^2/s) =

; Thermal conductivity of sample [W/mK]

Where ρ is the density of the material and

Cp is the specific heat capacity (J/gK)

Sincerely,

ALLSCHOOLABS® SIGN DATE SCIENTIFIC

Ogundipe Adebanke

Executive Marketing Director