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**Birzeit University**

Physics department

physics 211

**Experiment No.9**

**Thermal Conductivity**

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Section №: 1

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**-Abstract:**

\* The aim of the experiment:

To find the thermal conductivity of ebonite using Lee's disk method.

\* Tools :

Lee's disk apparatus, stop watch ,holders and clamps, mercury thermometers, rubber tubing, steam heater.

**- Theory :**

If medium having conductivity **K** is placed between two heat reservoir with one at a temperature that is higher than that of the other ,then heat is transferred according to the equation:

= -KA ………(1)

Where **A** is the cross sectional area of the thermal conductor ,**dx** is its thickness, **dT** is the temperature difference across its end.

The rate of heat transfer also depends on the mass of the object , given by :

= -MC ………(2)

C is called specific heat and dT/dt is the rate of change of the object's temperature .

= K = MCT2

K =

C = 0.092 cal/gm.C

K unit in J/(K·mm.s)

**-procedure:**

1- the Lee's disk is suspended apparatus horizontally.

2-the water is heated.

3- When the temperature stop changing the two temperature are recorded.

4-the up cylinder is moved, and heat slab the down disk by the burner.

5-Heating is stop, the down disk allow to cool down while T as a function of time and recoded.

6- the diameter of the ebonite disk is measured , and thickness and mass of down disk.

**-Data and Calculations:**

T1 = (70 ±1) 0C

T2 = (48 ±1) 0C

M = (977 ±1) g

Thickness = (4.42 ±0.05) mm = d

D(diameter) = 0.117 m

|  |  |
| --- | --- |
| Temp.(0C) | Time(min) |
| 72 | 0 |
| 64 | 1 |
| 62 | 2 |
| 60 | 3 |
| 58 | 4 |
| 56 | 5 |
| 55 | 6 |
| 53 | 7 |
| 52 | 8 |
| 51 | 9 |
| 50 | 10 |
| 49 | 11 |
| 47 | 12 |
| 46 | 13 |
| 45 | 14 |
| 44 | 15 |

Equation for graph :

y = ,

=

At x = 48 :

= 2.19 = 0.006 0C/min =

K = = 0.00010 J/K.m.m.s

=

∆K = 0.00010

So;

K = (1.0 ± 0.1)×10 -4 J/K.mm.s

**-Result and Conclusion:**

Kexp. = (1.0 ± 0.1)×10 -4 J/K.mm.s

Ktheoretical = 0.00014 J/K.mm.s

The value of thermal conductivity is acceptable because the 2∆R ≤d;

2(0.00001) ≤ 0.00011-0.00009 ; 0.00002 is equal 0.00002.

The percentage error = ×100%

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The % error = 28.6 % this value is an acceptable.

We have error when we measure the value of temperature , and there is power that was lose , and error in the stopwatch .

When we measure the diameter for **ebonite** ,we began measure circumference , then we find the diameter(d) by 2 , but the **ebonite** not the full cycle so we have error here .