**Birzeit University**

**Physics department**

**Physics 211**

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**Experiment number: (9)**

**Experiment name: Thermal conductivity**

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**Instructor: Dr. Wael .Q**

**Abstract:**

**In this experiment , the value of k (the thermal conductivity ) of an insulating material ,ebonite was determined using the lees Disk method and the result was**

**K=0.10± 0.06 W/k.m**

**Theory:**

**Thermal conductivity of a certain substance can be measured by putting the substance desired as a medium between two heat reservoirs with ones tempreture higher than that of the other , heat transfer will follow the equation :**

**dQ/dt= -KA(dT/dx)**

**A:cross sectional area of the thermal conductor**

**dx: is the thikness**

**dT :is the temperature difference across its ends**

**the rate also depends on mass and its heat capacity c**

**dQ/dt=-MC(dT/dt)**

**by ploting T vs t one can find dQ/dt for a substance with known mass and heat capacity from that K be found by similar manipulations.**

**experimental :**

1. **suspend the lees disk horizontally .**
2. **start heating the water container and observe the temperature T1 and T2 as the steam passes through the cylinder .**
3. **when the temperature stopes changing record the two tempreturs .**
4. **remove the cyllender and heat the copper for extra 10 degrees T2+10.**
5. **Stop heating and allaw the copper to cool and recording T as a function of time .**
6. **Measure the thickness and diameter and the mass of the mass of the c slap .**

**Data:**

**Data analysis :**

|  |  |
| --- | --- |
| time (s) | temp c0 |
| 0 | 52 |
| 105 | 50 |
| 190 | 48 |
| 315 | 46 |
| 440 | 44 |
| 592 | 42 |
| 750 | 40 |
| 900 | 38 |
| 1110 | 36 |
| 1275 | 34 |
| 1600 | 32 |
| 1880 | 30 |

**Slope =(dT/dt)=** **-0.0117 ± 0.00144 (c0/s)**

**dQ/dt=-MC(dT/dt)T2**

**M=990g**

**C(Cu)=0.386 J/gmk**

**T2=38c0**

**K=(4MCd(dT/dt)T2)/(πD2(T1-T2))**

**= (4\*990\*0.386\*0.00383\*0.0117)/(3.14\*(0.0121)\*(** **28))**

**=0.065 (W/K.m)**

**∆k/k=∆slope/slope +∆d/d+∆D/D+∆M/M+∆T1/T1+∆T2/T2=0.91701**

**∆k=0.059605 W/K.m**

**K=0.065 ± 0.059605**

**Results and conclusion :**

**K=0.10± 0.06 W/k.m**

**The theoretical value for the ebonite is 0.17 (W/K.m)**

**The percentage error = 40%**

**Discussion of results:**

**The diameter and the thickness measured was not of the actual disk that we used in the experiment but a smaller one by the instructions of the assistant so the approximation isn’t close and the error is huge and the results cannot be considered to report the value of the theremal conductivity of the ebonite**

**Conclusion :**

**Further testing is needed for reporting the value.**