**Class\_\_\_\_\_\_ Student ID\_\_\_\_\_\_\_\_\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Instructor\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pre-class Assignment Grade\_\_\_\_\_\_\_\_\_\_\_ Final Grade\_\_\_\_\_\_\_\_\_\_**

**Experiment：Measurement of the Specific Heat Capacity and Thermal Conductivity of Poor Conductors Using the Quasi-steady State Method**

**Ⅰ. Pre-Lab**

1. Based on the one-dimensional infinite flat plate heat conduction model, using Fourier's law of heat conduction, provide the derivation process for the thermal conductivity.
2. How to determine when the system has reached a quasi-steady state in this experiment?

**II.** **Recording of Original Data**

**Table 1** Measurement of the thermal conductivities and thermal capacities

Heating volage *V* = \_\_\_\_V，Resistance of the heating films *r* =\_\_\_\_\_，Sample thickness *R* = 0.010 m

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Record Points | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Time *τ*（min） |  |  |  |  |  |  |  |  |  |  |
| Thermoelectric pontential of the heating surface (加热面热电势) *S*1 (mV) |  |  |  |  |  |  |  |  |  |  |
| Thermoelectric pontential of the center surface (中心面热电势) *S*2 (mV) |  |  |  |  |  |  |  |  |  |  |
| Difference of the Thermoelectric pontentials of two surfaces (两面热电势之差)  *V*t =*S*1-*S*2 (mV) |  |  |  |  |  |  |  |  |  |  |
| Rise of S1 in 5 min.  (5分钟热电势升高)  Δ*V*h= (mV) |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Record Points | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | **Average** |
| Time *τ*（min） |  |  |  |  |  |  |  |  |  |  |  |
| Thermoelectric pontential of the heating surface (加热面热电势) *S*1 (mV) |  |  |  |  |  |  |  |  |  |  |  |
| Thermoelectric pontential of the center surface (中心面热电势) *S*2 (mV) |  |  |  |  |  |  |  |  |  |  |  |
| Difference of the Thermoelectric pontentials of two surfaces (两面热电势之差)  *V*t =*S*1-*S*2 (mV) |  |  |  |  |  |  |  |  |  |  |  |
| Rise of *S*1 in 5 min.  (5分钟热电势升高)  Δ*V*h= (mV) |  |  |  |  |  |  |  |  |  |  |  |

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| **Instructor**  **Signature** |  |

**Ⅲ.** **Data Processing**

1．Plot the ΔT-τ and T-τ curves on a coordinate paper or using computers, judge from the graph when the steady state is reached, and calculate the ΔT and dT/dτ.

2. Calculate the thermal conductivities and specific heat capacities of the organic glass and the rubber sample.

**Ⅳ. Analysis of the Experimental Phenomena and Conclusion**

**Ⅴ.** **Questions**

1. In this experiment, we adopt the method of heating at both ends of the sample to determine the thermal conductivities and specific heats of the samples based on the temperature difference between the heated surface and the center surface, as well as the rate of temperature rise. Why are four samples used in this experiment?
2. What are the conditions for the system to reach the steady state in this experiment?

3) Will the steady state be maintained indefinitely in this experiment? Does longer time guarantee better experimental data?