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

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

**Experiment: Measurement of the Surface-tension Coefficient of a Liquid**

**Ⅰ. Pre-Lab Preparation**

1. What is surface tension? What factors are related to the liquid surface tension coefficient?

2. What is the experimental principle of measuring the surface tension coefficient of liquids using the pull-off method?

**II. Data Sheet**

1．The inner and outer diameter of the lifting ring（unit：mm）

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of measurements | 1 | 2 | 3 | 4 | 5 | mean |
| inner diameter *D*inside |  |  |  |  |  |  |
| outer diameter *D*outside |  |  |  |  |  |  |

2．Use the difference-in-differences method to find the conversion coefficient of the instrument *K*：

Record the weight as initial reading first *V*0=\_\_\_\_\_\_\_\_mV，then add a weight of 500mg each time (the standard weight complies with the national standard, and the relative error is 0.05%)

|  |  |  |  |
| --- | --- | --- | --- |
| Weight  10-6Kg | Record after adding | Record after reducing |  |
| 0 |  |  |  |
| 500.00 |  |  |  |
| 1000.00 |  |  |  |
| 1500.00 |  |  |  |
| 2000.00 |  |  |  |
| 2500.00 |  |  |  |
| 3000.00 |  |  |  |
| 3500.00 |  |  |  |

Use the difference-in-differences method to find the reading of the electronic scale corresponding to every 500 mg Δ*V*，then=\_\_\_\_\_\_\_N/mV.

3．Use the pull-off method to find the electronic scale reading corresponding to the pulling force：

Table 1. Liquid surface tension coefficient measurement under room temperature

Water temperature (room temperature) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_oC,

electronic scale initial reading*V*0=\_\_\_\_\_\_\_\_mV

|  |  |  |  |
| --- | --- | --- | --- |
| Number of measurements | Maximum reading when pulling off  *V*1 (mV) | Lifting ring reading  *V*2 (mV) | Surface tension corresponding reading *V*=*V*1-*V*2 (mV) |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| Mean value |  |  | =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Table 2. Liquid surface tension coefficient measurement under different temperature

Water temperature (room temperature) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_oC,

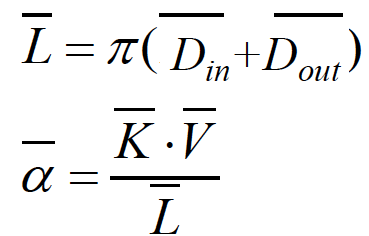
electronic scale initial reading*V*0=\_\_\_\_\_\_\_\_mV

|  |  |  |  |
| --- | --- | --- | --- |
| Number of measurements | Maximum reading when pulling off  *V*1 (mV) | Lifting ring reading  *V*2 (mV) | Surface tension corresponding reading *V*=*V*1-*V*2 (mV) |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| Mean value |  |  | =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

|  |  |
| --- | --- |
| **Lecturer** |  |
| **Signature** |  |

**III. Data Processing**

1．Calculate surface tension coefficient α under room temperature and the uncertainty：







2．Find the theoretical value of the surface tension coefficient α of water at room temperature from the appendix, compare the experimental results with this value, find the relative error, and analyze the results.

3. Measure the surface tension coefficient at different temperatures and analyze and compare it with the theoretical value of the surface tension coefficient of water at room temperature.

**Ⅳ. Discussion and Conclusions**

(Discuss the sources of errors in liquid surface tension coefficient measurements and how to improve measurement accuracy?)

**Ⅴ. Questions**

1. What approximations were made in deriving the formula for measuring the liquid surface tension coefficient? What is the physical meaning of each quantity in the formula?
2. If the weight of pulling up the liquid film is taken into account, how should the experimental results be corrected?