

测定金属的电阻率

选择倍率×0.01

序号	长度(cm)	直径(mm)	阻值(×0.01Ω)	电阻率ρ(×10 ⁻⁸ Ω·m)
1	25.00	4.06	0.05034	2.607
2	24.97	4.04	0.05040	2.587
3	24.95	4.06	0.05049	2.620
4	25.05	4.04	0.05046	2.582
5	25.03	4.06	0.05056	2.615
平均值	25.00	4.052	0.05045	2.6022

$$\rho = \frac{R \cdot s}{l} = \frac{\pi R \cdot d^2}{4l}$$

$$\bar{\rho} = \frac{1}{5} \sum_{i=0}^5 \rho_i = 2.6022 \times 10^{-8} \Omega \cdot m$$

$$U_A = \sqrt{\frac{1}{n(n-1)} \sum_{i=1}^n (\rho_i - \bar{\rho})^2} = 7.559 \times 10^{-11}$$

$$U_B = \bar{\rho} \sqrt{(\frac{\Delta R}{R})^2 + (\frac{2\Delta d}{d})^2 + (\frac{\Delta l}{l})^2} = 2.622 \times 10^{-10}$$

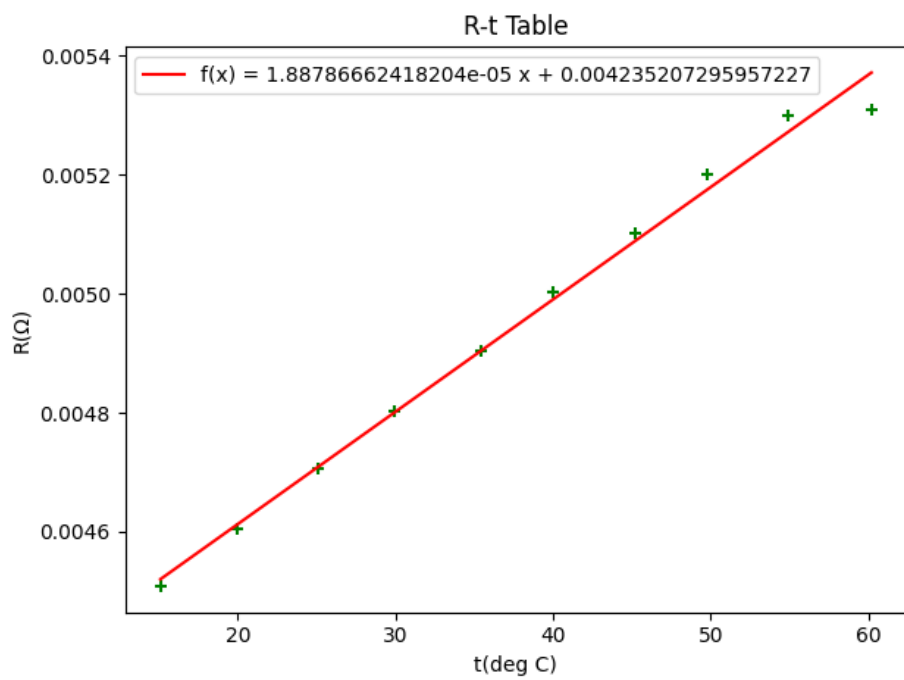
$$U = \sqrt{U_A^2 + U_B^2} = 2.729 \times 10^{-10}$$

$$\therefore \rho = (2.6022 \times 10^{-8} \pm 2.729 \times 10^{-10}) \Omega \cdot m$$

测定金属的电阻温度系数

选择倍率×0.1

序号	温度(°C)	阻值(×0.1Ω)	序号	温度(°C)	阻值(×0.1Ω)
1	15.1	0.045079	6	40.0	0.050035
2	20.0	0.046041	7	45.2	0.051030
3	25.1	0.047051	8	49.8	0.052009
4	29.9	0.048039	9	54.9	0.053005
5	35.4	0.049042	10	60.2	0.053098



知 $R = R_0(1 + \alpha t)$

由图知 $R_0 = 4.24 \times 10^{-3} \Omega$

则 $\bar{\alpha} = 4.46 \times 10^{-3} {}^{\circ}C^{-1}$

理论值 $\alpha = 433 \times 10^{-5} {}^{\circ}C^{-1}$

相对误差 $E = \frac{|\alpha - \bar{\alpha}|}{\alpha} \times 100\% = 3\%$