Experimental No. (5)
VARIATION OF RESISTANCE WITH TEMPERATURE

Phys Lab 2

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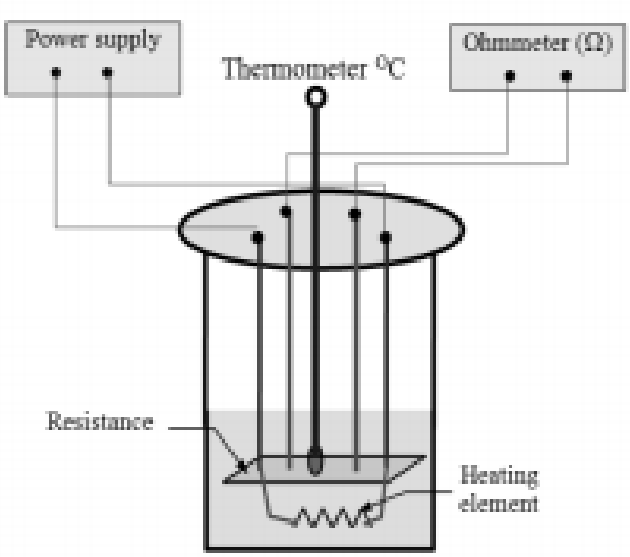


Fig.1

For a given material, the resistivity ρ *increases with temperature:*

$$\rho_T = \rho_0[1 + \alpha(T - T_0)]$$

ρ: is the resistivity of the metal at certain temperature T , measured in °C

ρ_0: is the resistivity at a reference temperature T_0 , usually it is taken 20 °C

α : is the **temperature coefficient of resistivity**

$$\alpha = \frac{1}{\rho_0}\frac{\Delta\rho}{\Delta T}$$

Where

$$\Delta\rho = \rho - \rho_0, \qquad \Delta T = T - T_0$$

The temperature coefficient of resistivity for various metals are given in table 27.1

SI units of α is $^\circ C^{-1}$

Because $R = \rho\frac{\ell}{A} \Rightarrow R = R_0[1 + \alpha(T - T_0)]$

$$R_T = R_0[1 + \alpha(T - T_0)$$

$$R_T = R_0 + R_0\,\alpha(T - T_0)$$

$$\Delta T = T - T_0$$

Y = mx + b

	$T(C^o)$	$R(\Omega)$
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

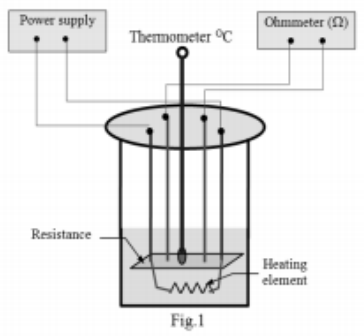
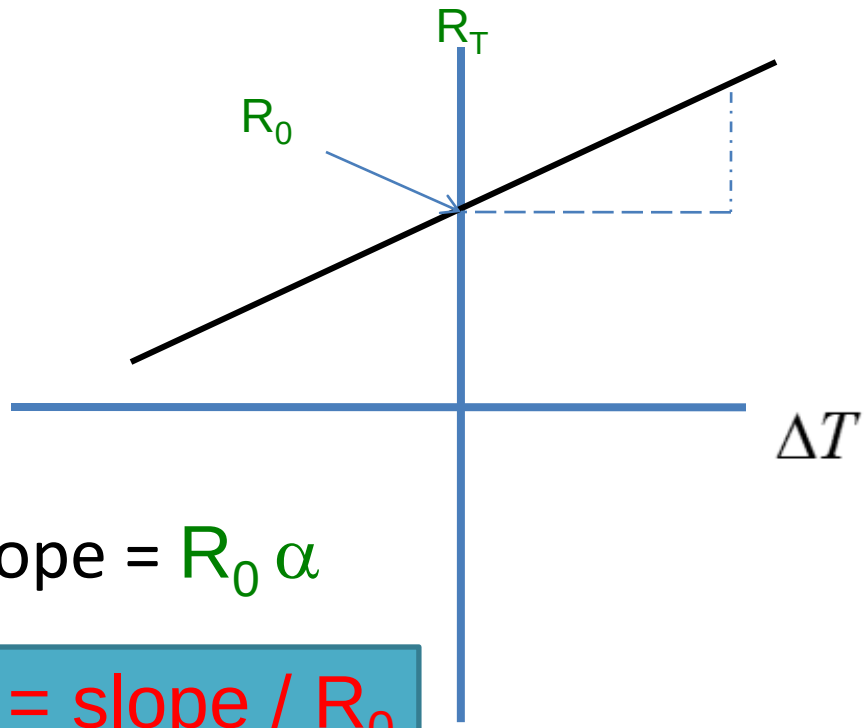


Fig.1



Slope = $R_0\,\alpha$

α = slope / R_0

Intercept = R_0

Data of Experiment

Temperature	Resistance
80	45.5
76	45
72	44.5
70	44.1
66	43.6

Note :

R0 = 36.8 ohms at room temp.

Theoretical value of $\alpha = 0.0039\ 1/c$

Percent Error Formula $= \frac{|\text{Experimental Value} - \text{Theoretical Value}|}{|\text{Theoretical Value}|} \times 100$