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Resistivity lab report conclusion

Abstract
 The purpose of this experiment was to determine the resistivity of various metals and an alloy. The resistivity was calculated using the measured resistance, length, and cross-sectional area of the wires. The results show that the resistivity of the metals increases with length and decreases with increasing cross-sectional area. The alloy (Cu/Ni) has a significantly higher resistivity than the pure metals.



DATA SHEET: $d = 0.44 \text{ mm}$
 $R_{Cu} = 1.68 \Omega$

R # (metal)	L (m)	Gauge #	A (mm ²)	R _{exp} (Ω)	R _{theo} (Ω)	% diff.	V (V)	I (A)
1 (Cu)	10 m	22	0.320 mm ²	0.6 Ω	0.68 Ω	11.4%	1.5	2.5 A
2 (Cu)	10 m	28	0.203 mm ²	2.3 Ω	1.9 Ω	21.1%	1.5	0.7 A
3 (Cu)	20 m	22	0.320 mm ²	1.2 Ω	1.36 Ω	12.5%	1.5	1.3 A
4 (Cu)	20 m	28	0.203 mm ²	4.4 Ω	4.2 Ω	5.4%	1.5	0.3 A
5 (Cu/Ni)	10 m	22	0.320 mm ²	17.3 Ω	NA	NA	1.5	0.09 A

Calculate the alloy resistivity (see Eq. 1) using the experimental resistor value for the 5th resistor:
 $\rho_{CuNi} = \frac{R_{exp} \cdot A}{L} = \frac{17.3 \Omega \cdot 0.320 \text{ mm}^2}{10 \text{ m}} = 5.62 \times 10^{-7} \Omega \cdot \text{m}$

Question to Answer
 1) why case 1, 3, and 4 had a large percent difference?
 2) what are the errors?

Answers:
 1) $R = \rho \frac{L}{A}$
 $A = R \cdot \frac{L}{\rho} = \frac{0.68 \Omega \cdot 10 \text{ m}}{1.68 \times 10^{-8} \Omega \cdot \text{m}} = 4.05 \times 10^{-7} \text{ m}^2$
 $A = R \cdot \frac{L}{\rho} = \frac{1.9 \Omega \cdot 10 \text{ m}}{1.68 \times 10^{-8} \Omega \cdot \text{m}} = 1.13 \times 10^{-7} \text{ m}^2$
 $A = R \cdot \frac{L}{\rho} = \frac{1.36 \Omega \cdot 20 \text{ m}}{1.68 \times 10^{-8} \Omega \cdot \text{m}} = 1.61 \times 10^{-7} \text{ m}^2$
 $A = R \cdot \frac{L}{\rho} = \frac{4.2 \Omega \cdot 20 \text{ m}}{1.68 \times 10^{-8} \Omega \cdot \text{m}} = 5.0 \times 10^{-7} \text{ m}^2$

2) $\% \text{ diff.} = \frac{R_{exp} - R_{theo}}{R_{theo}} \times 100\%$
 1) $\frac{0.68 - 0.68}{0.68} \times 100\% = 0\%$
 2) $\frac{2.3 - 1.9}{1.9} \times 100\% = 21.1\%$
 3) $\frac{1.2 - 1.36}{1.36} \times 100\% = -11.8\%$
 4) $\frac{4.4 - 4.2}{4.2} \times 100\% = 4.8\%$

Calculations for Alloy Resistivity:
 $\rho = \frac{R \cdot A}{L} = \frac{17.3 \Omega \cdot 0.320 \text{ mm}^2}{10 \text{ m}} = 5.62 \times 10^{-7} \Omega \cdot \text{m}$

Current Calculations:
 $I = \frac{V}{R}$
 1) $\frac{1.5 \text{ V}}{0.6 \Omega} = 2.5 \text{ A}$
 2) $\frac{1.5 \text{ V}}{2.3 \Omega} = 0.65 \text{ A}$
 3) $\frac{1.5 \text{ V}}{1.2 \Omega} = 1.25 \text{ A}$
 4) $\frac{1.5 \text{ V}}{4.4 \Omega} = 0.34 \text{ A}$
 5) $\frac{1.5 \text{ V}}{17.3 \Omega} = 0.087 \text{ A}$

