Question #78081:

Two mateeial Ge and Al are cooled from 300k to 600k. What will be its effect on their resistivity?

Solution:

$T_1 = 300K$

$T_2 = 600K$

$\alpha = \dfrac{R_2 - R_1}{R_1(T_2 - T_1)}$

$R_2 - R_1 = \alpha R_1(T_2 - T_1)$

$R_1\left(\dfrac{R_2}{R_1} - 1\right) = \alpha R_1(T_2 - T_1)$

$\dfrac{R_2}{R_1} - 1 = \alpha(T_2 - T_1)$

The value $\left(\frac{R_2}{R_1} - 1\right)$ indicates how many times the resistance change

For Germanium (Ge) $\alpha_{Ge} = -0{,}05$ (Tabular value from the directory)

$\left(\frac{R_2}{R_1} - 1\right) = -0{,}05 \cdot (600 - 300) = -15$ or -1500%

The value has a minus sign, and hence the resistance will increase with cooling

For Aluminum (Al) $\alpha_{Al} = 0{,}00429$ (Tabular value from the directory)

$\left(\frac{R_2}{R_1} - 1\right) = 0{,}00429 \cdot (600 - 300) = 1{,}287$ or 128.7%

The value has a plus sign, and hence the resistance will decrease with cooling

Answer:

For Ge resistance will increase 15 times(1500%), and for Al resistance will decrease 1,287 times(128,7%) after cooling(*nonlinearity of the temperature coefficient is not taken into account in the calculations*)