Answer on Question#37928, Physics, Other

Question:

When the temperature of a thin silver [α = 19 × 10-6 (C°)-1] rod is increased, the length of the rod increases by 3.1 × 10-3 cm. Another rod is identical in all respects, except that it is made from gold [α = 14 × 10-6 (C°)-1]. By how much ΔL does the length of the gold rod increase when its temperature increases by the same amount as that for the silver rod?

Answer:

The increasement of length of the rod is given by formula

$$\Delta L = \alpha L_0 \Delta T$$

where α – is linear expansion coefficient of the rod, L_0 – initial length of the rod, ΔT - increasement of temperature of the rod.

The initial length and the increasement of temperature of the silver and the gold rods are the same, so we can write an equation

$$\frac{\Delta L_s}{\alpha_s} = \frac{\Delta L_g}{\alpha_g}$$

where $\Delta L_s, \alpha_s$ - the increasement of length and the linear expansion coefficient of the silver rod and $\Delta L_g, \alpha_g$ - the increasement of length and the linear expansion coefficient of the gold rod.

So we can find ΔL_g

$$\Delta L_g = \frac{\alpha_g}{\alpha_s} \Delta L_s$$

$$\Delta L_g = \frac{14 \times 10^{-6}}{19 \times 10^{-6}} \cdot 3.1 \times 10^{-3} = 2.3 \times 10^{-3} cm$$

The answer is: $\mathbf{\Delta L_g = 2.3 \times 10^{-3} cm}$