

Answer on Question 49189, Physics, Mechanics | Kinematics | Dynamics

Question:

The temperature of a 1 m long aluminum rod is 20°C. If the temperature is increased to 70°C, what is the length of the rod?

Solution:

By the definition of the linear thermal expansion we have:

$$\Delta L_a = \alpha_a L_{0a} \Delta T,$$

where ΔL_a is the change in the length of the aluminum rod after the change of temperature, $\alpha_a = 23 \cdot 10^{-6} \text{ } ^\circ\text{C}^{-1}$ is the coefficient of linear expansion for aluminum, L_{0a} is the length of the aluminum rod before the change of temperature, ΔT is the change of temperature.

Therefore, substituting all data from condition of the problem to the formula for linear thermal expansion we obtain:

$$\Delta L_a = 23 \cdot 10^{-6} \text{ } ^\circ\text{C}^{-1} \cdot 1\text{m} \cdot (70^\circ\text{C} - 20^\circ\text{C}) = 0.00115\text{m}.$$

Then the length of the aluminum rod would be:

$$L = L_{0a} + \Delta L_a = 1\text{m} + 0.00115\text{m} = 1.00115\text{m}.$$

Answer:

The length of the aluminum rod is 1.00115 meters.