Answer on Question#78487 - Physics - Other

A square made of silver is heated from 100C to 500C. The original side of the square is 1cm. What its area after heating?

Solution:

The linear coefficient of thermal expansion of silver is $\alpha_L = 18 \cdot 10^{-6}\ \mathrm{K}^{-1}$. The area thermal expansion coefficient is two times the linear coefficient:

$$\alpha_A = 2\alpha_L = 36 \cdot 10^{-6}\ \mathrm{K}^{-1}$$

The original area:

$$A_0 = (1\ \mathrm{cm})^2 = 1\ \mathrm{cm}^2$$

Final area:

$$A = A_0(1 + \alpha_A \Delta T)$$

Since $\Delta T = 500°\mathrm{C} - 100°\mathrm{C} = 400°\mathrm{C}$, we obtain

$$A = A_0(1 + \alpha_A \Delta T) = 1\ \mathrm{cm}^2(1 + 36 \cdot 10^{-6}\ \mathrm{K}^{-1} \cdot 400°\mathrm{C}) = 1.0144\ \mathrm{cm}^2$$

Answer: $1.0144\ \mathrm{cm}^2$.