Answer on Question 57589, Physics – Molecular Physics | Thermodynamics

Question:

A certain amount of heat is added to a mass of aluminum and its temperature is raised to 57 degrees Celsius. Suppose the same amount of heat is added to the same mass of copper. How much does the temperature of copper rise?

Solution:

We can find the amount of heat that is added to a mass of aluminum from the formula:

$$Q_1 = m_1 c_1 \Delta t_1,$$

here, m_1 is the mass of aluminum, $c_1 = 910 \frac{J}{kg°\text{C}}$ is the specific heat capacity of aluminum, Δt_1 is the change in the temperature.

Similarly, we can find the amount of heat that is added to the mass of the copper:

$$Q_2 = m_2 c_2 \Delta t_2,$$

here, m_2 is the mass of copper, $c_2 = 390 \frac{J}{kg°\text{C}}$ is the specific heat capacity of copper, Δt_2 is the change in the temperature.

Since the amounts of heat Q_1 and Q_2 are the same, we can equate both expressions:

$$m_1 c_1 \Delta t_1 = m_2 c_2 \Delta t_2.$$

Finally, we can find Δt_2 from the previous formula (since $m_1 = m_2$, the masses are canceled):

$$\Delta t_2 = \frac{c_1 \Delta t_1}{c_2} = \frac{910 \frac{J}{kg°\text{C}} \cdot 57°\text{C}}{390 \frac{J}{kg°\text{C}}} = 133°\text{C}.$$

Answer:

$\Delta t_2 = 133°\text{C}.$