

Answer on Question #55031-Physics- Electromagnetism

A certain resistance thermometer at triple point of water is $R_0 = 152.0 \text{ ohms}$. What is the temperature of the system in degrees Celsius when the resistance of the thermometer is $R = 230.51 \text{ ohms}$.

Solution

The temperature at triple point of water is

$$T_{tr} = 273.15 + 0.01 = 273.16 \text{ K.}$$

If X_T and X_{tr} be the magnitude of the thermometric property measured at unknown temperature T and triple point of water (273.16K), then

$$T = T_{tr} \frac{X_T}{X_{tr}} = 273.16 \cdot \frac{X_T}{X_{tr}}.$$

In our case (temperature on resistance scale)

$$T_R = T_{tr} \frac{R_T}{R_{tr}} = 273.16 \cdot \frac{230.51 \text{ ohms}}{152.0 \text{ ohms}} = 414.25 \text{ K.}$$

The temperature of the system in degrees Celsius is

$$t = T_R - 273.15 = 414.25 - 273.15 = 141.1^\circ\text{C.}$$

Answer: 141. 1°C.