

Question#19549

an aluminum cup of 100cm³ capacity, is completely filled with ethanol at 15 degree Celsius. how much ethanol, if any, will spill out of the cup if the temperature of both cup and ethanol is increased at 22 degree Celsius?

Solution:

An ethanol have coefficient of volumetric expansion more then an aluminum, according this on heating from 15⁰C to 22⁰C the volume of ethanol will be more then volume of a cup at:

$$\Delta V = (\beta_{\text{ethanol}} - \beta_{\text{aluminum}})V\Delta T,$$

where: β_{ethanol} – coefficient of volumetric expansion of ethanol, β_{aluminum} – coefficient of volumetric expansion of aluminum, ΔT – changing of temperature.

$$\beta_{\text{ethanol}} = 750 * 10^{-6}, \beta_{\text{aluminum}} = 69 * 10^{-6}$$

$$\Delta V = (750 * 10^{-6} - 69 * 10^{-6})100 * 7 = 0.4767 \text{ cm}^3$$

Answer: will be spill out $\approx 0.5 \text{ cm}^3$ of ethanol.