Answer on Question #49330 – Chemistry – Inorganic Chemistry

Question:

When 3.890 g of solid sodium nitrate are dissolved in 50.00 g of water in a styrofoam calorimeter to form 53.89 g of aqueous sodium nitrate, the temperature decreases by 3.5 degrees. Determine the heat flow for this mass of solid, and then calculate the enthalpy change in kjoules for dissolving one mole of solid.

Answer:

The heat flow can be determined according to the equation:

$\Delta Q = \Delta T \times m(H_2O) \times C(H_2O)$, where $C(H_2O) = 4.186$ J/(g K) – the heat capacity of water.

Thus, $\Delta Q = -3.5 \times 50 \times 4.186$ J = -732.55 J

The enthalpy per mole is defined:

$\Delta H = -\Delta Q/n$, where $n = m(NaNO_3)/Mw(NaNO3)$ is the number of moles for $NaNO_3$.

n = 3.890 g/ 85 g/mole = 0.045765 mole

Thus, ΔH = 732.55 J/ 0.045765 mole = 16006.88 J/mole = **+16.00688 kJ/mol**