Answer on question #43481 – Chemistry – Physical Chemistry

Question

The solubility product of PbI_2 is $7.47 \cdot 10^{-9}$ at 15°C & $1.3 \cdot 10^{-8}$ at 25°C. Calculate the molar heat of solution of PbI_2.

Solution

According to Van't Hoff equation:

$$\frac{dlnK_{eq}}{dT} = \frac{\Delta H}{RT^2}$$

The definite integral between temperatures 15°C (1) and 25°C (2) is then:

$$\ln\left(\frac{K_1}{K_2}\right) = \frac{-\Delta H}{R}\left(\frac{1}{288.15} - \frac{1}{298.15}\right)$$

$$\Delta H = -R \cdot \ln\left(\frac{K_1}{K_2}\right) \cdot \frac{288.15 \cdot 298.15}{298.15 - 288.15} = -8.3145 \cdot \ln\left(\frac{7.47}{13.9}\right) \cdot \frac{85911.92}{10} = 44.4 \frac{kJ}{mol}$$

Answer: 44.4 kJ/mol