Answer on the Question #67760, Chemistry / General chemistry

Calculate ΔH of the reaction shown below. Balance the equation before beginning the calculation. DO NOT use the Heat of Formations table! Use the heats of formation shown below.

NO(g) + H2O(l) → HNO3(l) + H2(g) + O2(g)

ΔH (NO) = 44.5 kJ/mol

ΔH(H_2O) = -180 kJ/mol

ΔH(HNO_3) = -213 kJ/mol

ΔH(H_2) = 0 kJ/mol

ΔH(O_2) = 0 kJ/mol

Solution:

Balanced equation:

$$2NO(g) + 6H_2O(l) \rightarrow 2HNO_3(l) + 5H_2(g) + O_2(g)$$

Enthalpy of reaction is the difference between the sum of standard heat of formation of products and the sum of standard heat of formation of reactants:

$$\Delta H_{reaction} = \sum \Delta_f H_{products} - \sum \Delta_f H_{reactants}$$

Enthalpy of the reaction studied:

$$\Delta H_{reaction} = \sum 2 \cdot \Delta_f H_{HNO_3} + 5 \cdot \Delta_f H_{H_2} + \Delta_f H_{O_2} - \sum 2 \cdot \Delta_f H_{NO} + 6 \cdot \Delta_f H_{H_2O}$$

$$\Delta H_{reaction} = \sum 2 \cdot (-213) + 5 \cdot 0 + 0 - \sum 2 \cdot 44.5 + 6 \cdot (-180) = -421 - (-991)$$
$$= 570\ kj/mol$$

Answer: $\Delta H_{reaction} = 570\ kj/mol$

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