Answer on Question #67790 - Chemistry – Other

Task:

Calculate ΔH for:

$CaO(s) + SO_3(g) = CaSO_4(s)$ (ΔHx=?)

From the following given data:

(1) $H_2(g) + 1/2\ O_2(g) = H_2O(l)$ (ΔH_1 = -285.8 kJ);

(2) $SO_3(g) + H_2O(l) = H_2SO_4(l)$ (ΔH_2 = -132.5 kJ);

(3) $H_2SO_4(l) + Ca(s) = CaSO_4(s) + H2(g)$ (ΔH_3= -602.5 kJ);

(4) $Ca(s) + 1/2\ O_2(g) = CaO(s)$ (ΔH_4=-634.9 kJ).

Solution:

According to **Hess' Law** is:

If a chemical equation can be written as the sum of several other chemical equations, the enthalpy change of the first chemical equation equals the sum of the enthalpy changes of the other chemical equations.

1) Analyze what must happen to each equation:
   a) first equation ⇒ do not flip it
   b) second equation ⇒ do not flip it (this put the SO_3 on the left-hand side, where we want it)
   c) third equation ⇒ do not flip it (this put the $CaSO_4$ on the right-hand side, where we want it)
   d) fourth equation ⇒ flip it (this put the CaO on the left-hand side, where we want it)

2) Then,

$$\Delta Hx = \Delta H_1 + \Delta H_2 + \Delta H_3 - \Delta H_4;$$

3) Add up ΔH values for our answer:

$$\Delta Hx = \Delta H_1 + \Delta H_2 + \Delta H_3 - \Delta H_4 = -285.8\ kJ + (-132.5\ kJ) + (-602.5\ kJ) – (-634.9\ kJ) = -385.9\ kJ.$$

$$CaO(s) + SO_3(g) = CaSO_4(s)\ (\Delta Hx=-385.9\ kJ)$$

Answer: ΔHx = -385.9 kJ.