Answer on Question #55780 – Chemistry– General Chemistry

Question:
Given the standard enthalpy changes for the following two reactions:

(1) $2Fe(s) + O_2(g) \rightarrow 2FeO(s)$..... $\Delta H° = -544.0$ kJ

(2) $2Zn(s) + O_2(g) \rightarrow 2ZnO(s)$.....$\Delta H° = -696.6$ kJ

What is the standard enthalpy change for the reaction?

$FeO(s) + Zn(s) \rightarrow Fe(s) + ZnO(s)$.....$\Delta H° = ?$

Answer:

The equation for the standard enthalpy *change* of formation is commonly used:

$$\Delta H^o_{reaction} = \sum \Delta H^o_f(products) - \sum \Delta H^o_f(Reactants)$$

This equation essentially states that the standard enthalpy *change* of formation is equal to the **sum of the standard enthalpies of formation of the *products*** minus the **sum of the standard enthalpies of formation of the *reactants***.

In our case:

$FeO(s) + Zn(s) \rightarrow Fe(s) + ZnO(s)$

$$\Delta H^o_{reaction} = \Delta H^o_f(ZnO) + \Delta H^o_f(Fe) - \sum \Delta H^o_f(Zn) - \Delta H^o_f(FeO)$$

$\Delta H^o_f(Fe) = 0$; $\Delta H^o_f(Zn) = 0$ because standard enthalpy of formation of a pure element is in its reference form its standard enthalpy formation is **zero**. Then

$$\Delta H^o_{reaction} = \Delta H^o_f(ZnO) + - \Delta H^o_f(FeO) = -696.6/2 - (-544.0/2) = \mathbf{-76.3\ kJ}$$