Answer on Question #59865, Chemistry / General Chemistry

Write an equation including state symbols for the standard enthalpy of combustion of CH_4(g) and CH_3COOH(I)

Write an equation including state symbols, for the standard enthalpy of formation of CH_3OH(I) and $AlCl_3$(s) and $CuSO_4 \cdot 5H_2O$(s)

How will you differentiate between both enthalpies of reaction?

Solution:

The standard enthalpy of formation is called enthalpy of the formation reaction of one mole of a substance from simple substances, its components are resistant to standard conditions (in what they are at T = 298 K and P = 1 atm). The formation of simple substances of aggregation, stable at T = 298 K, is assumed to be zero.

The standard enthalpy of formation of 1 mole of methanole from carbon and hydrogen and oxygen is equal to the heat of reaction:

$C\,(s) + 2H_2\,(g) + 1/2O_2\,(g) = CH_3OH\,(l)$

The standard enthalpy of formation of 1 mole of $AlCl_3$(s) from carbon and hydrogen and oxygen is equal to the heat of reaction:

$Al(s) + 3/2Cl_2(g) = AlCl_3(s)$

The standard enthalpy of formation of 1 mole of $CuSO_4 \cdot 5H_2O$(s) from carbon and hydrogen and oxygen is equal to the heat of reaction:

$Cu(s) + S(s) + 4.5O_2(g) + 5H_2(g) = CuSO_4 \cdot 5H_2O(s)$

Under Hess's law, the enthalpy of any reaction is the difference between the sum of the heats of formation of all the products and the sum of the heats of formation of all the reagents in the reaction:

ΔH^O reaction = $\Sigma\Delta H_f^O$ (products) - $\Sigma\Delta H_f^O$ (reagents)

The standard enthalpy of combustion of substance is an oxidation reaction enthalpy 1 mole of a substance with oxygen to oxides extremely of oxidation. The enthalpy of combustion of nonflammable substances is equal to zero. Aggregate state of products of combustion - in what they are at T = 298 K and P = 1 atm.

The standard enthalpy of combustion is the enthalpy of the reaction of

The reaction of combustion of $CH_4(g)$:

$CH_4(g) + 2O_2(g) = CO_2(g) + 2H_2O(l)$

Under Hess's law, the enthalpy of this reaction is equal:

$\Delta H°_{comb}(CH_4(g)) = \Delta H°_f(CO_2(g) + 2\Delta H°_f(H_2O(l)) - [\Delta H°_f(CH_4(g) - 2\Delta H°_f(O_2(g))]$

The reaction of combustion of $CH_3COOH(l)$:

$CH_3COOH(l) + 4O_2(g) = 4CO_2(g) + 2H_2O(l)$

$$\Delta H°_{comb}(CH_3COOH(l)) = 4\Delta H°_f(CO_2(g) + 2\Delta H°_f(H_2O(l)) - [\Delta H°_f(CH_3COOH(l)) - 4\Delta H°_f(O_2(g))]$$

Distinction between processes of education and combustion of substance is same, as between the birth and death (more precisely, cremation of a body).