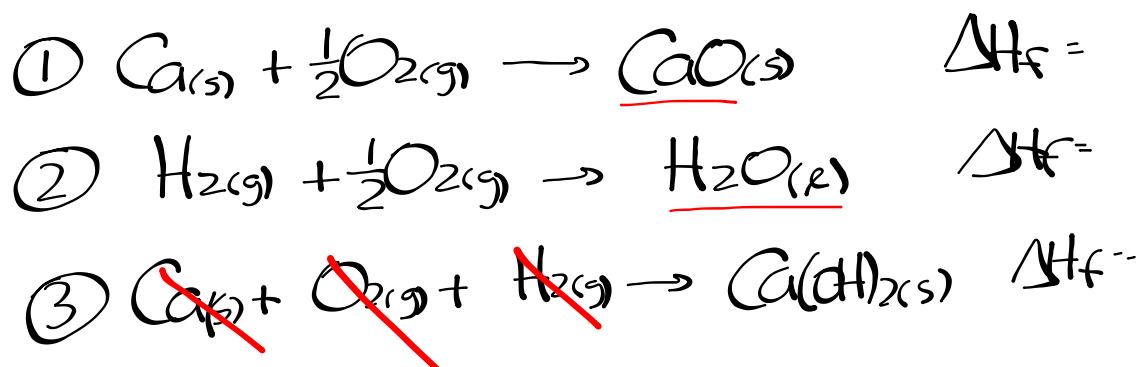


Predicting ΔH_r Using Formation Reactions

The Standard Enthalpy Change (ΔH°_r) for a reaction can be found by writing the formation equation and corresponding standard enthalpy change for each compound in the given equation and then applying Hess' Law.



Step 1: Write formation equations (with standard enthalpy change) each compound in the given equation.

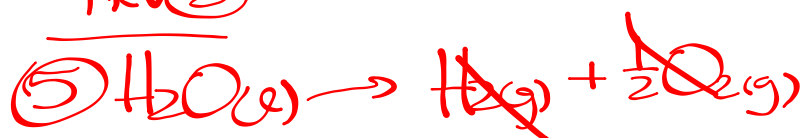


Step 2: Apply Hess's Law

Rev ①



Rev ②



Enthalpies of Formation to Predict ΔH_r

$$\Delta H_r = \underset{\substack{\text{Ca(OH)}_2 \\ \text{product}}}{\Delta H_f} + \underset{\substack{\text{CaO} \\ \text{reactant}}}{(-\Delta H_f)} + \underset{\substack{\text{H}_2\text{O} \\ \text{reactant}}}{(-\Delta H_f)}$$

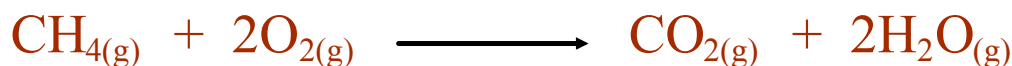
$$\Delta H_r = \underset{\text{Ca(OH)}_2}{\Delta H_f} - (\underset{\text{CaO}}{\Delta H_f} + \underset{\text{H}_2\text{O}}{\Delta H_f})$$

$$\Delta H_r = \underset{\text{products}}{\Delta H_{fp}} - \underset{\text{reactants}}{\Delta H_{fr}}$$

$$\Delta H_r = \sum n H_{fp} - \sum n H_{fr}$$

knowing that $\Delta H = nH$

Ex. What is the standard molar enthalpy of combustion of methane fuel?



$$\Delta H_r = ?$$

$$\Delta H_r = \sum n H_{f,p} - \sum n H_{f,r}$$

$$\Delta H_r = \left[(1 \text{ mol}) \left(\overset{\text{CO}_{2(g)}}{-393.5 \frac{\text{kJ}}{\text{mol}}} \right) + (2 \text{ mol}) \left(\overset{\text{H}_2\text{O}_{(g)}}{-241.8 \frac{\text{kJ}}{\text{mol}}} \right) \right] - \left[(1 \text{ mol}) \left(\overset{\text{CH}_4}{-74.4 \frac{\text{kJ}}{\text{mol}}} \right) + (2 \text{ mol}) \left(\overset{\text{O}_2}{0 \frac{\text{kJ}}{\text{mol}}} \right) \right]$$

$$\Delta H_r = (-877.1 \text{ kJ}) - (-74.4 \text{ kJ})$$

$$\underline{\underline{\Delta H_r = -802.7 \text{ kJ}}}$$

$$\Delta H_r = n H_r$$

$$H_r = \frac{\Delta H_r}{n} = \frac{-802.7 \text{ kJ}}{1 \text{ mol}} = \boxed{-802.7 \frac{\text{kJ}}{\text{mol}}}$$

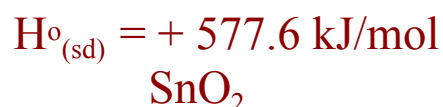
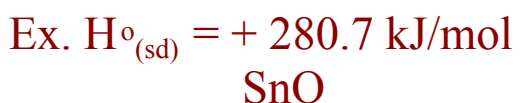
Homework

Worksheet

Thermal Stability

Thermal Stability - the tendency of a compound to resist decomposition when heated.

- the more endothermic the simple decomposition (sd), the more stable the compound.



Therefore SnO_2 is more stable.

*Normally not given the H_{sd} , but given the H_f

Which is more stable, ammonia or butane?