Enthalpy Changes for Chemical Reactions

NO (g, 1 bar) + ½ O₂ (g, 0.2 bar) → NO₂ (g, 1 bar)

\[ \Delta r H = \sum_{i=1}^{n} v_i \Delta f H_i \]

\[ \Delta r H = \Delta f H_{NO} - \Delta f H_{NO} - ½ \Delta f H_{O_2} \]

\[ \Delta H = \sum_{i=1}^{n} v_i H_i \]

\[ \Delta H = H_{NO_2} - H_{NO} - ½ H_{O_2} \]

\[ \Delta H = \Delta f H_{NO_2} - \Delta f H_{NO} - ½ \Delta f H_{O_2} \]

\[ \Delta H = \Delta H_{NO_2} = H_{NO_2} - ½ H_{N_2} - H_{O_2} \]

\[ \Delta H = \Delta H_{NO} = H_{NO} - ½ H_{N_2} - ½ H_{O_2} \]

\[ \Delta H = \Delta H_{NO_2} - \Delta H_{NO} - ½ \Delta H_{O_2} \]

Enthalpy is a state function, the change for the reaction is independent of the path.

\[ dH = \sum_{i=1}^{n} H_i \, dn_i \quad \text{dn}_i = v_i \, d\xi \]

\[ dH = \sum_{i=1}^{n} v_i H_i \, d\xi \quad \text{cst. T&P} \]

\[ \int_{\text{react}}^{\text{prod}} \, dH = \sum_{i=1}^{n} v_i H_i \int_{0}^{l} d\xi = \Delta H = \sum_{i=1}^{n} v_i H_i \]

\[ \frac{\partial H}{\partial \xi}_{T,P} = \sum_{i=1}^{n} v_i H_i = \Delta H \]

The reaction enthalpy is the derivative of the enthalpy with respect to the extent of the reaction.

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