Chemistry 2201 Lab: BOMB

Determining heat of combustion(ΔH_{comb}) of sucrose and thus ΔH_f for sucrose.

Must determine heat of combustion using bomb calorimeter.

Constant Volume $q_{COMB} = \Delta U_{COMB}$

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$$q_{CAL} = C_{CAL}\Delta T$$

$$q_{CAL} = -q_{COMB}$$

Part I: Determining C_{CAL} using benzoic acid.

$$-q_{COMB} = -q_{BA} + -q_{WIRE}$$

Measure ΔT and get C_{CAL}.

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Part II: Measure ΔT for sucrose run and use C_{CAL} from benzoic acid run to determine $-q_{COMB}$.

$$-q_{SUCROSE} = -q_{COMB} + q_{WIRE}$$

$q_{SUCROSE} = \Delta U_{comb}$ for sucrose.

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To determine ΔH_{COMB}.

$$\Delta H = \Delta U + \Delta n_{gas} RT$$

$$C_{12}H_{22}O_{11}(s) + 12O_2(g) \rightarrow 12CO_2(g) + 11H_2O(l)$$

$$\Delta n_{gas} = 12 \text{ mol} - 12 \text{ mol} = 0$$

Convert ΔH_{COMB} to $\Delta H°_{COMB}$.

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To determine $\Delta H°_f$.

$$C_{12}H_{22}O_{11}(s) + 12O_2(g) \rightarrow 12CO_2(g) + 11H_2O(l)$$

$$\Delta H_f°[C_{12}H_{22}O_{11}(s)] = 12\Delta H_f°[CO_2(g)] + 11\Delta H°_f[H_2O(l)] - \Delta H°_{comb}$$