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$$\begin{aligned} 4) \quad \Delta_r G_m^\ominus(1) &= \Delta_f G_m^\ominus(\text{C}_2\text{H}_4\text{O}) - \Delta_f G_m^\ominus(\text{C}_2\text{H}_4) \\ &= -13.1 \text{ kJ} \cdot \text{mol}^{-1} - 68.1 \text{ kJ} \cdot \text{mol}^{-1} \\ &= -81.2 \text{ kJ} \cdot \text{mol}^{-1} \end{aligned}$$

$$\begin{aligned} \Delta_r G_m^\ominus(2) &= 2\Delta_f G_m^\ominus(\text{O}_2) + 2\Delta_f G_m^\ominus(\text{H}_2\text{O}) - \Delta_f G_m^\ominus(\text{C}_2\text{H}_4\text{O}) \\ &= 2 \times (-394.4 \text{ kJ} \cdot \text{mol}^{-1}) + 2 \times (-228.6 \text{ kJ} \cdot \text{mol}^{-1}) - 68.1 \text{ kJ} \cdot \text{mol}^{-1} \\ &= -1314.1 \text{ kJ} \cdot \text{mol}^{-1} \end{aligned}$$

$$\Delta_r G_m^\ominus(2) \ll \Delta_r G_m^\ominus(1)$$

热力学条件对反应不利

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