Reactions:

$$\text{`CH}_2\text{O'} + \text{O}_2 \xrightarrow{R1} \text{CO}_2 + \text{H}_2\text{O}$$

$$\text{`CH}_2\text{O'} + 4\,\text{Fe(OH)}_3 \xrightarrow{R2} 4\,\text{Fe}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$$

$$4\,\text{Fe}^{2+} + \text{O}_2 + 10\,\text{H}_2\text{O} \xrightarrow{R8} 4\,\text{Fe(OH)}_3 + 8\,\text{H}^+$$

Rates:

$$R_1 = k_{OM} \cdot [\text{OM}] \cdot \frac{[\text{O}_2]}{K_m^{\text{O}_2} + [\text{O}_2]} \tag{1}$$

$$R_2 = k_{OM} \cdot [\text{OM}] \cdot \frac{[\text{Fe(OH)}_3]}{K_m^{\text{Fe(OH)}_3} + [\text{Fe(OH)}_3]} \cdot \frac{K_m^{\text{O}_2}}{K_m^{\text{O}_2} + [\text{O}_2]} \tag{2}$$

$$R_8 = k_8 \cdot [\text{Fe}^{2+}] \cdot [\text{O}_2] \tag{3}$$

Rates with Temperature dependence:

$$R_1 = Q_{10}^{(T-T_0)/10} \cdot k_{OM} \cdot [\text{OM}] \cdot \frac{[\text{O}_2]}{K_m^{\text{O}_2} + [\text{O}_2]} \tag{4}$$

$$R_2 = Q_{10}^{(T-T_0)/10} \cdot k_{OM} \cdot [\text{OM}] \cdot \frac{[\text{Fe(OH)}_3]}{K_m^{\text{Fe(OH)}_3} + [\text{Fe(OH)}_3]} \cdot \frac{K_m^{\text{O}_2}}{K_m^{\text{O}_2} + [\text{O}_2]} \tag{5}$$

$$R_8 = k_8 \cdot [\text{Fe}^{2+}] \cdot [\text{O}_2] \tag{6}$$