

Pathway	Stoichiometry
Primary redox reactions	
Aerobic degradation	$(\text{CH}_2\text{O})_x(\text{NH}_3)_y(\text{H}_3\text{PO}_4)_z + (x + 2y)\text{O}_2 + (y + 2z)\text{HCO}_3^- \rightarrow (x + y + 2z)\text{CO}_2 + y\text{NO}_3^- + z\text{HPO}_4^{2-} + (x + 2y + 2z)\text{H}_2\text{O}$
Denitrification	$(\text{CH}_2\text{O})_x(\text{NH}_3)_y(\text{H}_3\text{PO}_4)_z + \frac{(4x+3y)}{5}\text{NO}_3^- \rightarrow \frac{(2x+4y)}{5}\text{N}_2 + \frac{(x-3y+10z)}{5}\text{CO}_2 + \frac{(4x+3y-10z)}{5}\text{HCO}_3^- + z\text{HPO}_4^{2-} + \frac{(3x+6y+10z)}{5}\text{H}_2\text{O}$
Sulfate reduction	$(\text{CH}_2\text{O})_x(\text{NH}_3)_y(\text{H}_3\text{PO}_4)_z + \frac{x}{2}\text{SO}_4^{2-} + (y - 2z)\text{CO}_2 + (y - 2z)\text{H}_2\text{O} \rightarrow \frac{x}{2}\text{H}_2\text{S} + (x + y - 2z)\text{HCO}_3^- + y\text{NH}_4^+ + z\text{HPO}_4^{2-}$
Methanogenesis	$(\text{CH}_2\text{O})_x(\text{NH}_3)_y(\text{H}_3\text{PO}_4)_z + (y - 2z)\text{H}_2\text{O} \rightarrow \frac{x}{2}\text{CH}_4 + \frac{x-2y+4z}{2}\text{CO}_2 + (x - 2z)\text{HCO}_3^- + y\text{NH}_4^+ + z\text{HPO}_4^{2-}$
Secondary redox reactions	
Nitrification	$\text{NH}_4^+ + 2\text{O}_2 + 2\text{HCO}_3^- \rightarrow \text{NO}_3^- + 2\text{CO}_2 + 3\text{H}_2\text{O}$
Sulfide oxidation	$\text{H}_2\text{S} + 2\text{O}_2 + 2\text{HCO}_3^- \rightarrow \text{SO}_4^{2-} + 2\text{CO}_2 + 2\text{H}_2\text{O}$
AOM	$\text{CH}_4 + \text{CO}_2 + \text{SO}_4^{2-} \rightarrow 2\text{HCO}_3^- + \text{H}_2\text{S}$
Adsorption reactions and mineral precipitation	
NH ₄ adsorption	$\text{NH}_4^+ \xrightarrow{K_{\text{NH}_4}} \text{NH}_4^+(\text{ads})$
P adsorption and desorption	$\text{PO}_4^{2-} \xrightarrow{K_{\text{PO}_4}^{\text{I,II}}} \text{PO}_4^{2-}(\text{ads}); \quad \text{PO}_4^{2-} \xrightarrow{k_s} \text{Fe-bound P} \xrightarrow{k_m} \text{PO}_4^{2-}$
CFA precipitation	$\text{PO}_4^{2-} \xrightarrow{k_a} \text{CFA}$
Pyrite precipitation	$\text{Fe}^{2+} + \text{HS}^- \rightarrow \text{FeS} + \text{H}^+, \text{FeS} + \text{H}_2\text{S} \rightarrow \text{H}_2 + \text{FeS}_2$