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Quantifying Ammonia Oxidation Kinetics of Nitrosomonas europaea with Competitive Inhibition

Nitrification is the process of converting ammonia (NH_4) to nitrite (NO_2^-) and nitrate (NO_3^-) and is driven by microorganisms. Nitrification is used in wastewater treatment systems to reduce negative side effects of nitrogen pollutants in water. NH_4 oxidation to NO_2^- is the first nitrification step. This project investigated the effect of inhibitory compounds on ammonia oxidation by the bacterium *Nitrosomonas europaea* (*N. europaea*). *N. europaea* is thoroughly studied ammonia oxidizing bacterium (AOB). Several studies indicate that nitrification of nitrogen in wastewater systems is inhibited by wastewater contaminants such as phenol. The ammonia monooxygenase enzyme (AMO) is responsible for oxidizing NH_4 . The nitrification inhibition is a result of the AMO enzyme oxidizing contaminants in wastewater instead of NH_4 . Phenol is representative of several aromatic compounds found in wastewater contaminants such as pharmaceuticals, fragrances, and antibiotics. The contaminants act as inhibitory compounds to the AMO enzyme reacting with NH_4 . This study measured reaction rates of *N. europaea* in the presence of different concentrations of phenol and NH_4 . Five batch tests were conducted with varying concentrations of NH_4 . Each test consisted of four sets of triplicates with 0, 5, 10, and 20 μM concentration of phenol. The samples were evaluated using nitrite assays. This data was used to evaluate initial rates of the reaction at varying NH_4 concentrations. The method of initial rates was used to determine the enzyme kinetics; the results were used to compare the effect phenol concentration has on reaction rates. The results indicate that as phenol concentration increases, the reaction rate decreases. This kinetic model will be used to further understand nitrification in wastewater.