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Technical Bulletin

USE OF IRON WITH UV DISINFECTION

Background

Ultraviolet light (UV) is recognized as a cost-effective technology for inactivation of several parasites and viruses while eliminating reliance on chemical disinfection in water and wastewater systems.

UV light inactivates virus particles by penetrating the outer envelope and the capsid protein material around the nucleic acid. The UV is then absorbed by the nucleic acid where it induces double bonds between adjacent dimers in the DNA or RNA. When a sufficient number of dimers have formed, the virus is no longer able to replicate and is inactivated.

For this inactivation to occur, a certain level of UV radiation must be present to cause the reaction in the nucleic acid. The primary parameter used to measure this availability of UV light in the candidate water stream is UV Transmittance.

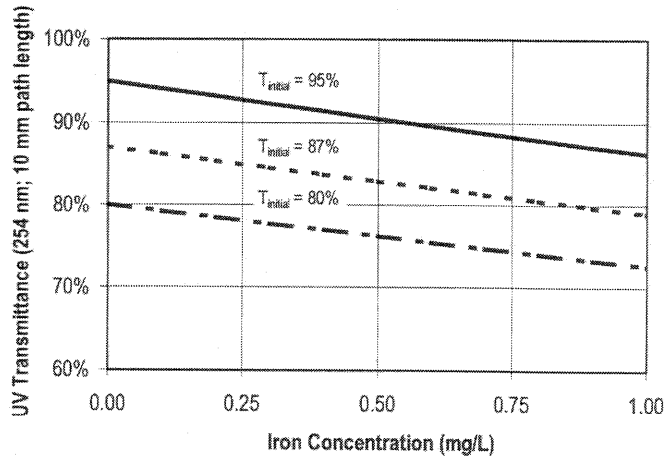
Iron effects on UV

Many chemicals used in water and wastewater treatment can absorb UV light and decrease UV transmittance. These include some common chemicals such as Hypochlorite, Ozone, Sulfite, Permanganate, and Hydrogen Peroxide. Iron in both ferric and ferrous forms can also absorb UV light.

The Solubility Factor

While the adjacent table shows that soluble ferric iron will certainly affect UV Transmittance, the conditions in typical water and wastewater treatment processes do not condone the presence of the soluble form of ferric iron. Most water and wastewater systems are operated at a pH where soluble ferric iron is not present. The insoluble iron generated by addition of ferric chloride will not remain in solution and will settle out prior to UV

disinfection units when chemical addition points are properly chosen. By adding ferric chloride prior to filtration or prior to settling steps in the treatment process, the possibility of iron interference in the UV system from ferric chloride use is eliminated.



The Benefits

Coagulation and precipitation have a significant effect on UV transmittance. The superior coagulation and precipitation properties of ferric chloride can in effect improve UV transmittance by removing a greater level of particulates that absorb UV than many other competing coagulants. Typical dosage levels of ferric chloride, when properly applied will not produce any significant detrimental effects to a UV disinfection system.