PSS Natural Organic Matter Theory

A literature search regarding the effects of Natural Organic Matter (NOM) on flocculation and effluent turbidity was done. These articles were used to help determine the anticipated results of the NOM experiments.

General Overview of Articles

"Comparison of coagulation behavior and floc structure characteristic of different polyferric-cationic polymer dual-coagulants in humic acid solution"

Authors: Jincheng Wei, Baoyu Gao, Qinyan Yue, Yan Wang, Weiwei Li, Xiaobiao Zhu

The article describes experiments performed using three different coagulants. The percentage humic acid removal was recorded for various pH and dosing conditions.

Generally, when pH is held constant (approximately 7.5), Humic Acid removal increases with increasing coagulant dosage. The correlation between coagulant dosage and acid removal is not linear, however. So, there is a point where additional coagulant will not result in significant humic acid removal. This means that there is an optimum amount of coagulant that should be used for effective humic acid removal. In these experiments, the maximum humic acid removal ranged from 80-90%. Also, when coagulant dosage was held constant and pH was varied from 3 to 10, humic acid removal decreased. The change in humic acid removal observed was approximately 10%.

"Floc Strength Evaluation at Alternative Shearing with Presence of Natural Organic Matters"

Authors: Shung-Shuan Sung, Sheau-Pyng Ju, Chien Hsu, Arun S. Mujumdar, and Duu-Jong Lee

The effects of natural organic matters (NOM) on Aluminum-floc stability were investigated by on-line probing of changes in floc diameters and interior fractal dimensions at alternative shearing using the small angle light-scattering technique. In this experiment, Humic acid was used to simulate NOM in water. The influent Water for this experiment has a final pH =7 after the Humic acid was added to the water and well mixed.

Generally, Humic acid in the water will cause the flock size to decrease. In this particular experiment, the diameters of the flocs decrease from 32 nm to 25 nm. The more humic acid, the smaller the flocs. At low levels of humic acid, increased shear rate can allow the particles to regain their size. However, at higher levels of humic acid, decrease in floc size is completely irreversible. Note that when no humic acid is present and shear rate increases, floc size also increases. In addition to causing floc size to decrease, the humic acid also results in "loose" floc formulation.

"Impact of Natural Organic Matter on Floc Size and Structure Effects in Membrane Filtration"

Authors: Sangyun A. Lee, Anthony G. Fane, and T. David White

This experiment examined the effect of humic acid on the aggregation behavior of hematite colloids and, subsequently, assess the impact on the specific resistance and compressibility of microfiltration cakes formed from these aggregates.

In this experiment, the floc size increases as a function of time when no humic acid is present. However, when humic acid is added, floc size decreases as a function of time. In general, more humic acid makes the decrease in floc size more pronounced.

What to Expect

Based on the articles above, experiments should yield smaller floc size than experiments without NOM. Based on the capture velocity theory, the effluent turbidity should increase. In addition, not all of the humic acid will be removed from the water, so the effluent water will contain NOM.

Bibliography

