Discussion

The ion exchange capacity of clays is an important factor in their coagulation. The first phase of such coagulation consists of a process of ion exchange between the coagulation ion and the clay particle. This point has been investigated quite thoroughly, and test data has been assembled to confirm this. Three clay suspensions of the same gravimetric concentrations are used. The kaolinite has the concentration 0.1, 0.5, 1.0, 3.0, 5.0 ppm. The fuller earth and laterite are the same concentrations. However the base exchange capacity of three suspensions are widely different. From graph, we can see that kaolinite is applicable with a wide pH range at the same alum dosage

From these results we can say that the change conditions and the dose of coagulants depend on pH. In the case of organic colloids, the coagulations optimum almost alway concides with charge reversal of the particles but in the case of clay, the zone of charge reversal does not indentify the point of optimum coagulation in some instances.some clay dispersions coagulate even in the zone where the mobility of particles has substantial value. The ion exchange capacity of clays as a factor in their coagulation and the ion exchange of metal ions on clay particles are also such a factor.

From Experiment we can discuss the effect of alum alone and Coagulant aids with alum; If we use alum alone

floc...

floc-froms are not good enough and settle more slowly than coagulant aids with alum. To compare these results we explain effect, of them in the raw water.

Alum is know to cause a change in the pH value of the water.Fig.8 and 9 indicate the magnitude of this change. It is seen that when pH is between 7-8 this change will be quite small. When the pH is outside this range, the change will be large.

Fig.10 compares the use of Kaolinite, Laterite and Fullers earth as coagulant aids with alum as coagulant. Kaolinite is seen to produce best floc in shortest time and can be used with water having a wide range of pH. All these coagulant aids, however, help form better flocs in shorter time than using alum alone as shown in Fig. 12-19

Coagulation by alum alone

When we use the dosage of alum 10 ppm. At the pH range from 4.5 to 7 the coagulation is poor and good alternatly. This may be due to reversal charge of colloidal particles. That is the charge of colloids may be incresase or decrease or charge from positive to negative good coagulation occured over a wide range of pH. from about 3 to 5. At pH 6.2 and 6.7 are better coagulation but in the narrow pH range. The zone of poor coagulation begin again at pH, up to about pH 9.0 and begin to be good again when the pH is beyond this point.

The dosage of alum 15 ppm. The wide zone of good coagulation occured from pH 3.8 to 7.0 Between these 2 points, the coagulation tends to be slightly poor, but in a narrow range from pH 4.8 to 5.3 the alum dosage of this is greater than the first series only 5 ppm, but the results are very different at pH 3 to 7. The lower pH the effect is better. The high pH almost the same as the first.

The dosage 30 ppm. of alum the wide zone of good coagulation occured from pH 3.8 to 10. The high pH from 7.0-10.00 is the same. The dosage 60 ppm. of alum the pH 3 one up to 7.7

From these test, we know that pH of water and the dosage of alum are so important effect on coagulation.

The best coagulation occurs when pH range from 3.8 to 7.0 The dosage of alum is 30 ppm. Coagulation most occur on the acid reaction. So we said that when an aluminium salt is to be used as flocculating agent of electronegative material, the highest efficiency can only be attained by adjusting the pH to a point at which the products of hydrolysis of the aluminium salt constitute an electropositive solution of maximum activity. It is primarily the products of hydrolysis of the salts of aluminium and ion which are responsible for the electrical neutralization and Flocculation of electronegative colloids.

Coagulation aids With alum

Aid A.

Aid A is Fuller's earth at dosage 0.1 ppm. gives the same rate of settling. At the higher dose 0.5, 1, 3 ppm, the rate of settling time is increased, but final settling time is the same as alum alone, so the use of this coagulation aids is little effect.

Aid B.

Aid B is laterite at dosage 0.1 ppm. gives the same rate of settling. At the higher dose of 0.5, 1, 3 ppm, the rate of settling time is increased. At pH 6.2 to 8.3 the final result is the same but at low pH it's reduces turbidity. So laterite can use as coagulant aids in the plant.

Aid C.

Aid C. is Kaolinite Kaolinite is the most effective of three coagulant aids. We use Aid C. in two groups. First, aid C. with alum dosage of 15 ppm. and second, Aid C. with alum dosage 10 ppm. From data we can see that Aid C. can produse good floc and when we use it to settle rapidly. The range of pH is wide. From the results it shows clearly in graph.

The reasons which we use these coagulant aids with alum.

1, They form floc larger than using alum alone because clay particles combine with alum floc, so they make floc good enough to settle.

2, When they form floc, the time to settle is more rapidly than use alum alone because the size of flocs are large and they settle by its gravity very rapid.

3, From graph they show that coagulant aids can reduce dosage of alum because of their ion exchange properties.

4, For economic purpose: to be use coagulant aids which are easy to find and low cost are better than to be use alum alone, because the cost of alum is expensive.

In small plant, the use of clays as coagulant aids is very suitable for economic reason. In larges plant, this method can also be used. The character of the floc, in the conditioned and settled water is very important. If the floc formed is large enough to settle at the bottom of the sedimentation tank, water with few unsettled flocs will pass through the filter. When flocs appears in the filter, the sand beds should be carefully inspected to determine, the loss of head and the time for washing the sand bed due to these flocs, according to the theory that the mat of floc on the surface of the sand bed created a much greater loss of head. If the floc is few the maintenance of the sand is low. For the low cost maintanance of the sand filter it is very important to remove flocs as much as possible before the water is passed through the filter. By comparing the cost it will be found that using coagulant aids are more economic than long without item.

Conclusion

From experiments it can be concluded that:

1. Alum alone.

Alum dosage 15 ppm. effect good coagulation from pH 3.8 to 7.0

Alum dosage 10 ppm. effect good coagulation from pH 6.2 to 6.7 and 3.7 to 5.0

2. Alum and Fuller's earth.

Alum dosage 15 ppm. and Fuller's earth effect good coagulation from pH 5.0 to 8.3

3. Alum and laterite.

Alum dosage 15 ppm. and laterite effect good coagulation from pH 3.8 to 8.5

4. Alum and Kaolinite.

Alum dosage 15 ppm. and Kaolinite effect good coagulation from pH 3.8 to 8.3

Alum dosage 10 ppm. and Kaolinite effect good coagulation from pH 3.8 to 6.9

So Kaolinite can reduce dosage of alum from 15 ppm. to 10 ppm.

Suggestion for Further Study

Investigation into the effect of initial turbidity

Present investigation is confined to a raw water of turbidity of 190ppm which is the maximum turbidity of the Chao-Phya River water. It is established that initial turbidity has some influence on coagulation. It should have some influence therefore on coagulants and coagulant aids dosages. An experiment can be designed to study this by keeping pH constant and varying the initial turbidity.

Investigation into the changes in treated water characteristics.

The results of this investigation shows marked increases in alkalinity of the treated water in all cases. It would be interesting to carry on experiments to find what other changes would be caused by coagulants and coagulant aids used because certain chemical reactions between aids and coagulants and chemicals in raw water appear to be taking place. For example, the use of Laterite as the coagulant aid may result in an increase in iron content of the treated water.

Types of coagulant aids

Present study is confined to using alum as coagulant with 3 kinds of aids. It would be of great interest to find aids that would be suitable for other coagulants, such as ferrous sulphate, sodium aluminate, chorinated copperas etc.It is thought that different coagulants would require differont coagulants aids.

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